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USSR Report

ENERGY

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PIPELINES

GENERAL

OIL AND GAS

ROLE OF GAS IN ENERGY PROGRAM EMPHASIZED

Moscow EKONOMICHESKAYA GAZETA in Russian No 12, Mar 84 p 1

[Article: "In Accordance with the Country's Energy Program"]

[Text] Realization of the USSR Energy Program is one of the prerequisites to speeding up conversion of the country's economy to the intensive path of development, it will permit an increase in the availability of power to branches of the national economy, especially to the agroindustrial complex, and it will promote successful fulfillment of the USSR Food Program.

The Energy Program calls for accelerated development of the gas industry, in order to satisfy the country's internal requirements and export needs. Based upon the decisions of the 26th Party Congress, the program has designated rapid growth of this branch as a task of paramount economic and political importance.

During the first stage in realization of the USSR Energy Program, which will be completed at the boundary line of the 1980's and 1990's, a rapid increase in the volume of recovering and transporting of Siberian gas to the country's European area is one of the chief factors in a reliable power supply for the economy. It is on the basis of a substantial growth in gas recovery that the national economy will be provided with the necessary amount of fuel during the period of preparation for the wider use of nuclear power, the development of coal stripmining and the use of renewable energy sources.

The USSR Energy Program has dictated not only an accelerated pace of development of the gas industry but also an increase in effectiveness of the recovery, transporting and use of gas. Introduction of the achievements of scientific and technical progress will serve to intensify the branch's operations. In so doing, major attention will be paid to the more complete recovery of gas condensate from the ground and to an increase in the yield of gas from the formation and in the integration and intensification of gas processing and automation of operating processes. By the end of the program's first stage, the automation level will exceed 90 percent for integrated gas-treatment installations and for remote control of arterial gas pipelines, and 98 percent for compressor stations.

In speaking at a meeting with voters about the results of developing the economy during the period between elections to the USSR Supreme Soviet, Comrade K. U. Chernenko noted: "Trunk gas pipelines about 40,000 kilometers in length have been built--on a scale and at a pace that the world has never seen before. We have managed to convert a multitude of plants, cities and villages to natural gas. The number of people who use gas at home has increased by 30 million."

Gas-industry workers successfully carried out 11th Five-Year Plan tasks and were actively engaged in realization of the USSR Energy Program.

Length of USSR Arterial Gas Pipelines (including pipeline bends) (thousands of kilometers)

Gas Recovery in the USSR (billions of cubic meters)

1980	1981	1982	1983	1984*
435	465	501	536	578

*Plan.

Key:

1. Ukhta.
2. Minsk.
3. Yaroslavl.
4. Moscow.
5. Perm.
6. Urengoy.
7. Kiev.
8. Uzhgorod.
9. Kharkov.
10. Ufa.
11. Tyumen.
12. Plan.
13. The system of Urengoy-European USSR trunk gas pipelines being erected during the 11th Five-Year Plan.

11409
CSO: 1822/212

GAS PRODUCTION, CONSERVATION OPERATIONS FOR 1984 DISCUSSED

Moscow EKONOMICHESKAYA GAZETA in Russian No 12, Mar 84 p 2

[Article by V. A. Dinkov, USSR minister of gas industry: "Effectiveness of the Recovery and Use of Gas"; passages rendered in all capital letters printed in boldface in source]

[Text] The gas industry has been assigned a most important role in successful realization of the USSR Energy Program, which has been called upon to help speed up conversion of the economy to an intensive and energy-saving path of development. Gas-industry workers, like all Soviet people, have unanimously approved the work results of the extraordinary February CPSU Central Committee Plenum as a battle program for action, they have adopted the principles and conclusions contained in a speech to voters by CPSU Central Committee General Secretary Comrade K. U. Chernenko, and they are striving with practical measures to multiply their contribution to strengthening the country's raw-materials and fuel-and-power balance.

THE SOCIALIST COMMITMENTS AND COUNTERPLANS THAT HAVE BEEN ADOPTED FOR THE FOURTH YEAR OF THE FIVE-YEAR PLAN REQUIRE THAT A RECORD ANNUAL GROWTH IN GAS RECOVERY IN THE AMOUNT OF 46 BILLION CUBIC METERS--3.8 BILLION CUBIC METERS OF IT ABOVE THE PLAN--BE PROVIDED FOR, THAT THE TASK FOR LABOR PRODUCTIVITY GROWTH BE OVERFULFILLED BY 1 PERCENT, THAT PRODUCTION EXPENDITURES BE REDUCED BY AN ADDITIONAL 0.6 PERCENT AND THAT 50 MILLION RUBLES OF ABOVE-PLAN PROFIT BE OBTAINED.

The main area for increase in gas recovery, both during the current five-year plan and in the long term, is still West Siberia, where the industry's main raw-materials base has been concentrated and formation of the world's largest gas complex continues. At Medvezhye, Vyngapur and the unique Urengoy fields, highly automated recovery enterprises of high capacity, from which hundreds of millions of cubic meters of gas travel great distances each day to customers over underground steel arterials, are already in operation. The socialist competition for Tyumen Oblast to recover 1 billion cubic meters per day of this high-quality fuel and valuable raw material for chemicals ahead of schedule, by the 115th anniversary of the day of V. I. Lenin's birth, is growing and is being expanded.

The Urengoy field is being developed with large-diameter wells whose flow rate is 1 million cubic meters of gas per day, wells that are sited in clusters.

This will enable gas-field service and utility lines to be shortened by 20 percent. It became possible, based upon the use of modular operating equipment with a unit productivity of 10 million cubic meters per day, to erect an integrated gas-treatment facility (UKPG) whose capacity is 2.5-fold that of the largest installations that were used during the 10th Five-Year Plan. As a result, specific metal consumption of the equipment could be reduced by 40 percent and labor expenditures and construction time cut in half.

Moreover, this field, which is to provide the major portion of the-All-Union increase in gas recovery, is to take a number of major steps to organize the preparation and transporting of gas condensate. For this purpose, integrated gas-treatment installations and condensate-stabilizing facilities, as well as the Urengoy-Surgut condensate pipeline, with a terminal pump station and a plant in Surgut for stabilizing the condensate, must be built at the field in 1984.

At the same time, preparations are being made in West Siberia for assimilation of the Yamburg field, which is second in size of gas reserves and which will go into industrial operation in 1986. Yamburg is marked by worse natural and climatic conditions. It is located in a zone of unbroken distribution of permafrost of high moisture content with embedded ice interlayers. It was decided to build the UKPG here, the operating equipment to be placed on modular pontoons that weigh 600 tons or more. This will enable the equipment to be delivered to the construction site 70-80 percent ready for erection.

The region outside West Siberia that is largest in level of gas recovery is Turkmenia, where new fields are being introduced, the chief one of which is Sovetabadskoye. It is planned that by the end of the 11th Five-Year Plan total gas recovery in Turkmenia will reach 81-83 billion cubic meters, in accordance with decisions of the 26th Party Congress.

A highly effective gas-chemicals subbranch, based upon integrated processing of the output of hydrogen-sulfide bearing gas-condensate fields, with maximum extraction of the sulfur, gas condensate and other useful components, which will serve as valuable raw materials for chemicals and petrochemicals and for obtaining fertilizer, continues to be developed. New processing capacity is being created in Uzbekistan, Kazakhstan and Astrakhan Oblast. The construction of a complex based upon the Astrakhan gas-condensate field, whose gas is marked by a unique hydrogen-sulfide content, is proceeding at a stepped-up pace.

Oil and gas resources in the waters of the seas and the USSR's continental shelf are being developed on a qualitatively new basis with the use of modern technical resources. In accordance with a long-term integrated program, a high-capacity supply-and-equipment base is to be created, and a large amount of scientific research and experimental design work is to be conducted. This will enable recovery of the oil and gas riches of the continental shelf to be promoted on a broad scale in the next few years, especially in arctic and Far Eastern seas.

THE RAPID PACE OF GAS RECOVERY IS OCCASIONED BY INTENSE DEVELOPMENT OF THE UNIFIED SYSTEM FOR THE COUNTRY'S GAS SUPPLY, ON A SCALE THAT WORLD EXPERIENCE

HAS NEVER KNOWN BEFORE. IN THE LAST 5 YEARS ALONE THAT HAVE ELAPSED SINCE THE ELECTIONS FOR THE USSR SUPREME SOVIET, ABOUT 40,000 KILOMETERS OF GAS PIPELINES HAVE BEEN BUILT. IT IS PLANNED TO CONNECT 10,500 KILOMETERS OF ARTERIAL GAS LINE AND 85 COMPRESSOR STATIONS TO THE UNIFIED SYSTEM IN 1984. AS A RESULT, ITS TOTAL LENGTH WILL EXCEED 166,000 KILOMETERS.

The main task here is that of providing for a further increase in the amount of gas transported to the country's northwestern, western and southern regions. This year the Urengoy-Pomary-Uzhgorod gas pipeline will have to be brought up to design capacity, and the new large 3,000-kilometer Urengoy-Central Economic Region (strand I) arterial and 29 compressor stations will be put into operation.

Major positive shifts have occurred in recent years in the operational re-equipping of arterial pipeline transport. During compressor-station construction, GTK-10 type transfer pumping units with gas-turbine drive and 10,000 kW of power will be replaced by compact, highly effective machines in modular basement-free versions of 16,000 and 25,000 kW of power and with improved automated control systems. Unified designs for compressor stations made of easily assembled buildings based upon them have been created.

The introduction of progressive equipment has enabled the requirement for scarce shut-off fixtures, joining parts and cable items to be cut to one-half or one-third and expenditures on compressor-station erection and time required for putting them into operation to be sharply reduced.

Labor Productivity Growth for Ministry of Gas Industry (1980 = 100 percent)

1980	1981	1982	1983	1984*
100.0	104.6	109.3	113.9	118.3

*Planned

The laboring collectives are now concentrating their attention on the elimination of bottlenecks, on an active search for and involvement in economic turnover of additional reserves for increasing the effectiveness of production and labor productivity. The industry is working to increase the utilization coefficient of operating equipment at gas-field facilities and also of underground gas storages, by connecting up to the maximum inactive wells and wells that have been on conservation status. Measures are being taken to improve the quality of treatment of gas at field facilities, especially in Turkmengazprom [Turkmen Gas Production Association].

As is known, when gas-condensate fields are developed, a large amount of condensate is left in the productive formations. With a view to removing it more completely from the ground, basically new methods are being tested. Thus, at the Vuktyl field a major industrial experiment on increasing condensate yield is being executed by introducing operating processes for stimulating the productive formations. If the experiment's results prove to be successful, this method will be disseminated also to other places.

In order to utilize all the valuable chemical components taken from the ground along with the gas condensate (propane, butane, ethane and so on), the Turkmen and Uzbek fields will use the closed system of collecting condensate from groups of nearby fields. This will enable the utilization coefficient of the

gas-condensate resources to be increased and tens of thousands of tons of valuable output to be brought into the national-economic turnover.

THE UTILIZATION OF GAS-TRANSPORTING ASSOCIATION CAPACITY IS BEING IMPROVED. THE EFFECTIVENESS AND RELIABILITY OF FUNCTIONING OF THE COUNTRY'S UNIFIED GAS SUPPLY SYSTEM, WHICH IS NOW THE WORLD'S LARGEST IN TERMS OF CAPACITY AND POWER AVAILABLE PER PRODUCTIVE UNIT, HAS BEEN RAISED APPRECIABLY.

However, the potential for increasing the productivity of existing arterial gas pipelines still has not been exhausted. They must be loaded up more completely through optimal gas-flow regulation, with the wide use of automated control systems and computers, periodic cleaning of the pipelines' interior cavities, and cooling of the gas--both at the gas-field terminal structures and at the compressor stations.

Solution of the indicated task depends greatly on a speedup of and improvement in the quality of overhaul of the linear portion of the arterial gas pipelines, bringing the kpd [efficiency] of gas transfer pumping units after repair up to the nominal values, and on the introduction of new energy-saving units with better technical and operational characteristics.

The effectiveness of using arterial transport will increase as a result of optimal loading thereof by season of the year through a further expansion of the network of underground gas storages. With a view to covering the seasonal nonuniformity of gas consumption, large underground storages are to be created in depleted fields and water-bearing formations. In order to compensate for peak consumption, small-capacity storages in salt deposits that are located in direct proximity to the most important cusomters are to be set aside.

Our drilling enterprises have great reserves at their disposal. They face important tasks in 1984. Primarily, they must sharply raise the level of work organization, increase effective drilling speed through improvement of the equipment for and the technology of drilling, cut nonproductive worktime as much as possible, and introduce internal production cost-accounting into each of the drilling brigades.

Natural gas is a valuable gift of nature, wealth for our whole country, which is extremely valuable for speeding up technical progress and the pace of development of the national economy and improving the living standard of the Soviet people. Delivering it primarily from remote recovery regions to the places of consumption causes enormous material expenditures, and, moreover, the gas reserves are nonrenewable.

THE SEARCH FOR RESERVES FOR THE RATIONAL AND ECONOMICAL USE OF GAS IS BECOMING ONE OF THE PARAMOUNT NATIONAL ECONOMIC TASKS.

Our country's technical policy calls for optimization of the spheres of consumption and distribution of gas, state inspection of its effective use in the national economy, and the development, manufacture and delivery to industrial, municipal and domestic-services customers of progressive equipment, burner installations and household equipment. Unfortunately, the results of a survey of industrial enterprises by USSR Glavgosgaznadzor inspectorates have shown that major nonproductive gas consumption is tolerated at many of them.

Our industry itself is one of the major gas consumers. The goal established for the ministry for saving gas in 1983 was met successfully. However, not everywhere yet is a thrifty attitude toward the resources allocated an inflexible rule. Thus, a number of gas-transport associations tolerated the overconsumption of gas for in-house needs and operating losses. It has now been resolved to bring consumption norms and the task for saving gas and other resources directly to each compressor station, department and brigade and to see that each worker and each brigade has personal accounts for savings and actively encourages achievement of the best results.

More complete use of secondary heat resources by compressor stations promises substantial savings. Because each year about 60 million gigacalories of heat from combustion products at gas-turbine installations are discharged directly into the atmosphere and only 15 percent of this is put to use. Incidentally, our industry is operating large hothouse farms that are based upon this heat. With a view to making more complete use of the large existing secondary-heat resources, a decision has been made to erect everywhere numbers of compressor stations with hothouse-vegetable combines of USSR Minplodovoshchkhoz [Ministry of Fruit and Vegetable Industry], USSR Minsel'khoz [Ministry of Agriculture] and other ministries.

Work has started on the use of combined steam and gas installations that use the heat of exhaust gases to drive blowers or to produce electricity at compressor stations. The wide introduction of such units will enable the consumption of gas for operating needs to be greatly reduced during long-distance transport thereof.

ACCORDING TO COMPUTATIONS, THE RATIONAL AND THRIFTY USE OF GAS BY ALL ITS CONSUMERS, ALONG WITH THE WIDE INTRODUCTION OF HIGHLY EFFECTIVE EQUIPMENT, MODERN BURNER INSTALLATIONS, AUTOMATED EQUIPMENT AND ADVANCED TECHNOLOGY, AS WELL AS THE MORE COMPLETE UTILIZATION OF SECONDARY ENERGY RESOURCES, WILL ENABLE 30-35 BILLION ADDITIONAL CUBIC METERS OF GAS TO BE PUT TO USE.

The industry took a confident start from the first days of 1984, and it continues to work with a precise production rhythm, providing for a continuous supply of gas for the national economy. The goals for January and February were met for all the basic technical and economic indicators. Above-plan gas recovery was 1.7 billion cubic meters.

Gas-industry workers, displaying high patriotic consciousness, are filled with resolve to do everything possible not only to fulfill but also to overfulfill the tasks for 1984 and the five-year plan as a whole.

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POLISH-BUILT TUGS AT WORK IN CASPIAN OILFIELDS

Baku VYSHKA in Russian 17 Nov 83 p 1

[Article by A. Gol'denberg of AzerINFORM [Azerbaijan SSR Information Agency]: "Under the 'Shel'f' Program"]

[Text] The new ship "Neftegaz-26" has started its first trip to the "Shel'f-2" drill rig. It is delivering a platform that will make hole at a new location in the Field imeni 28 Aprelya.

"Neftegaz-26" and "Neftegaz-3," which have arrived in the Caspian, were built at shipyards in the Polish cities of Gdansk and Szczecin specially to service drilling platforms. Such a ship is a singular marine "governess" for the mobile drill rigs. It will transport them to the operating sites, deploy and raise the anchors and anchor chains of semisubmersible rigs, and supply the platforms' crews with pipe, water, fuel, cement and other materials and tools. In case of emergency, the all-purpose ship can be used to participate in fire-fighting and rescue operations. Its 81-meter hull has a special reinforcement that enables the ship to operate under icy conditions.

"Neftegaz" type ships have unrestricted area of sailing. They can operate in seas and oceans, but they are poorly adapted to moving over rivers, so the sailors who delivered them to Baku had to perform no few important tasks. For the route from the Baltic Sea to the Caspian lies across the Neva, the Svir', the Volga-Baltic Canal, the Volga and the system of lakes and reservoirs. It was decided to tow the tow boat. The masts, cargo booms and sections of pipe on them were dismantled. Two metal pontoons were placed under each ship, to raise the hull 40 centimeters, and the extraordinary convoy moved out over the route. Like a relay, the marine and riverine tugmen successfully completed the complicated transfer, exchanging the "Neftegaz-26" and "Neftegaz-3" with each other. Next year some more "Neftegaz" type ships will come to the Caspian--the largest tugs in Kaspneftegazflot [Caspian Sea Oil and Gas-Field Fleet].

Collaboration with socialist countries has enabled the Caspian oilfield workers' fleet to be greatly enlarged.

"The ships for servicing the drilling platforms were built at Polish shipyards within the framework of the Shel'f program," one of the supervisors of the

Polish joint stock company "Tsentromor," Genrikh Tuchko, told the Azerinform correspondent. "Before the end of the five-year plan, another group of such ships will be built for the Caspian Sea oilfield workers, and, in all, the Soviet Union, Poland's largest trading partner, has ordered tens of 'Neftegaz' type ships from the PRL [Polish People's Republic], as well as ships of eight other types, which are intended for prospecting and recovering fuel in sea and ocean shelf areas."

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CASPIAN DRILLING-PLATFORM PLANT DUE FOR STARTUP IN 1984

Baku BAKINSKIY RABOCHIY in Russian 25 Jan 84 p 2

[Article by A. Bakun, electrical engineer of the decks department and candidate member of the Baku Committee of the Azerbaijan Communist Party; G. Shakhverdiyev, leader of an integrated brigade of SU-72 [Construction Administration No 72] and secretary of the party organization for administration; T. Sadykhov, chief of a production section of the board of the plant that is being built; P. Kasumov, correspondent of the wide-circulation newspaper KASPIY; and Z. Kuperman, public correspondent of BAKINSKIY RABOCHIY: "At the Threshold of Startup"]

> [Text] BAKINSKIY RABOCHIY at the construction site of the plant for making deepwater foundations.
>
> There is no need to introduce this construction project. BAKINSKIY RABOCHIY has told about it several times before. Let us recall: a plant is being erected to manufacture stationary deepwater foundations--one of the largest facilities of the republic's 11th Five-Year Plan. It should be put into operation this year. The enterprise is spread out over an area of 200 hectares, 120 of which are on land, the rest being on the sea shelf. It consists of tens of facilities for various purposes, which, taken together, make up a highly mechanized plant that is designed for producing up to 60,000 tons of metal structure per year.
>
> Publishing today this year's first information from its correspondents' post at the construction site, BAKINSKIY RABOCHIY will be attentively following the progress of the remaining operations and report regularly about them to its readers.

Much had already been done here before the start of the year. At least, all the facilities were sitting at their places. One can look down not only at the layout but also at the details. Some of them are already finished, while much remains to be done at others.

As a whole, construction is progressing successfully to completion. We managed to be present at a meeting of the construction staff, which is under

A. D. Lemberanskiy, deputy chairman of the republic's council of ministers. After remarking on the good work of the contractors in recent months, he dwelt on specific tasks. The main one is the full completion of construction.

Right now the organizations employed here are developing rigid schedules for performing the work, are concentrating the efforts and resources required for doing so, and are coordinating the order of arrival of the building materials and equipment.

It must be said that favorable conditions have been established at the construction project for the contracting organization collectives in matters of the wide manifestation of initiative, creativity and better organization of affairs at each workplace. During the staff meeting it was remarked that the supervisor who does not hide his difficulties and who knows what is happening at the site and what specific assistance is needed, receives help quickly. There had been talk, for example, about a shortage of pipe of a certain diameter, and then the place to get the pipe (on the very same day) was pointed out. The question about singling out a more "capable" diesel locomotive for hauling freight about the plant's rail siding was decided just as responsively....

But still, for the sake of correctness, it must be said that, despite all this, interruptions on the job are frequent here, work is not done on time, and, what is most intolerable, there are omissions.

Here is the main building. Four production lines that were designed for, altogether, 50,000 tons of metal structure per year, should be erected here. Two were to begin production before now, but it was possible to complete work on only one, where prestartup preparations are now going on. Indeed, the production of 14,000 tons of finished metal structure was planned for the plant this year. T. Mamedov, the director of the plant under construction, is not losing confidence that the plan will be met. Strictly speaking, the erection of one foundation (No 6) is now going on. True, it is not made of structure produced by the plant but of structure obtained through cooperation.

But the next foundation (No 8), for a sea depth of 147 meters, should be produced from start to finish at the enterprise. And now the delays and omissions that have been tolerated here since start of construction of the building are beginning to tell. The main deficiency is the low quality of the roof. SU-73 of Trust No 7 of the republic's Minpromstroy [Ministry of Industrial Construction] (the chief is A. Kurbanov) is employed here. It is perfectly obvious that, since the very start here, the technology for laying the roof had not been studied deeply, the available materials and the strong gusty winds that are common in this area were not taken into account. Of course, scientists should have been involved in this. In fact, a substantial part of the roof broke off, and now much work must be done to rebuild it. And this means an unforeseen delay in startup of the operating lines and excessive expenditures of labor, materials and time.

Matters are going no better in the electrodes department, the turnover of which also has been delayed. Two brigades from BMU-2 of Azneftekhimmontazh

[Azerbaijan Trust for the Erection of Petrochemical Facilities] is doing the erecting work here. Experienced brigade leaders I. Teterin and Yu. Solov'yev explain that the delay is caused by the fact that many footings that were readied by the builders from SMU-71 had to be redone during erection, and it was difficult to adapt the equipment to them. And the work sheets of the designs are inaccurate. In proof, Ivan Andreyevich Teterin cites for us the crushing machine. It still sags on its concrete footing, since the anchoring bolts did not go into the places intended for them. The concrete structure evidently will have to be broken up and laid over again. This could have been avoided if the drawings had been looked into properly ahead of time and if the "lack of coordination" had been corrected. In other words, if the drawings had been studied in true engineering style. But things have not been thought out thoroughly here--the work has been increased.

Two bays are being put into operation in the decks department. One of them could have been considered ready, but the concrete floors were not finished. Although the equipment has been installed now, only half of this work has still been accomplished. Meanwhile, two brigades of workers from SU-71 (22 people!) were idle, waiting for concrete, for more than half a shift. It must be said that there is enough concrete at the plant as a whole: three concrete-mixing units are in operation. At other sections we saw concrete arriving in adequate amounts. The workers here assured us that, since the start of the new year, this has become a chronic phenomenon, some kind of an organizational muddle occurs.

Much work has been done at the construction project by way of laying utility and service lines. Thus, thanks to the shock work of Mechanized Column No 23 (MK-23) of Kavkazenergoset'stroy [Caucasus Trust for the Construction of Power Grids], the plant has now been provided with electricity. This collective laid a high-voltage line on 24 metal supports from the Puta Substation, which was rebuilt for this purpose, to the construction project itself, and the plant substation has been erected and connected up.

Gas is already arriving at the plant, and the boilerhouse is operating on two boilers (altogether there will be six). Everything necessary for laying the railroad is arriving. It is now being readied for transfer to the jurisdiction of Ministry of Railways specialists.

The supply of process water has proved to be a weak spot in the system of service and utility lines. Only drinking water is still being used at the project. It even goes into mixing of the concrete, the testing of tanks and numerous other needs of the enterprise. But this is extravagant. Therefore, the construction project staff from SU-71 and its subcontractors are speeding up work on the turnover of process water from Lake Dzheyranbatan. A pipeline 36 km long is being laid. One of its strands, from the lake's southern wing to the construction project, is now ready. But in order to hook it up it is still necessary to join the southern part of the lake with the northern part, for continuous replenishment. This still has not been done. The water line is a very important facility, and not just for this construction project. Its capacity--48,000 cubic meters of water per day--will enable other coastal and other nearby enterprises to be supplied with process water.

PMK-168 [Mobile Mechanized Column No 168] of Trust No 2 of the republic's Minpromstroy is working on the purification structures. Four strands of these structures with a purification capacity of up to 17,000 cubic meters per day will be built. Until now only one--with a capacity of 4,000 cubic meters--has been turned over. During this work no few puzzles emerged that were connected with providing reliable sealing for the settling basins. The leaks are now being eliminated successfully--many inventions by innovators were used to detect and close them.

Aztransstroy [Azerbaijan Transport Construction Trust] builders are doing their part of the work with success. They carried out their plan for construction and installing work for last year by 103.7 percent. The erection of a canal, on which a barge of 18,000 tons' displacement that is unique in its dimensions has been moored, has been completed. The barge will deliver finished structure for the marine foundations that are being built in the Caspian. Twenty-four high-powered cranes have already been installed and assembled for erecting them. Four main berths are being erected, one of which is now finished. Work is also in progress on auxiliary berths.

Six Chernomortekhflot [Black Sea Service Fleet] ships are operating with precision. The task of the Black Sea sailors is to deepen the bay by several meters. Then the barge will be able to approach the berths and take on the plant's output--stationary deepwater foundations. Work has been going on since December 1979. The bay's depth at the time did not exceed 1 meter. The dredge "Ochakov" is raising soil from the bottom and discharging it into one of four scows, which are filled up in 30-40 minutes. A place for unloading the soil has been established at a distance of 7 miles, and more than 20 trips are completed in a day. It remains to be added that the Black Sea sailors have carried out their annual plan with a substantial amount to spare.

Not much time remains before the planned deadline for startup. Timely introduction of the plant will now depend entirely on how the supervisors of the trust and administrations and foremen and brigade leaders manage to organize later work with precision, strictly on schedule, so that not one workplace will be idle and nothing that is done will have to be redone. At facilities that are lagging behind schedule, the construction-project staff has proposed to convert to work under an extended workday, and, in some cases, to go to two-shift work. The guarantees of success, as was pointed out at the December 1983 CPSU Central Committee Plenum, are irreproachable execution by each person of his commitments, precision, initiative and unconditional fulfillment of the tasks that are faced.

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imeni Gazeta "Sotsialisticheskiy Donbass"

TECHNIQUES OF PROGRESSIVE COAL-MINING SECTION DESCRIBED

Moscow UGOL' in Russian No 2, Feb 84 pp 3-7

[Article by I. N. Bondarenko (Donetsk Branch of IPK of USSR Minugleprom [Ministry of Coal Industry]) and V. K. Fomin (of the Mine Administration imeni Gazeta "Sotsialisticheskiy Donbass"): "The Work of No 2 Mine Section Collective"]

> [Text] Brigades play an ever-increasing role in further intensification of social production,...they are becoming the basic production and social cell of laboring collectives.--From the CPSU Central Committee decree, "Further Development of and Increase in Effectiveness of the Brigade Form of Organization and of Work Incentives in Industry."

Section No 2 of Mine Administration imeni Gazeta "Sotsialisticheskiy Donbass" is excavating the gently sloping H_{10}"Livenskiy" seam, which is 1.2-1.3 meters thick and lies at an angle of 4-6 degrees. The seam's natural gas content is 25-30 m^3/ton. The seam is dangerous because of sudden outbursts of coal, gas and dust. The seam's roof is complicated by easiiy caving slate 0.1-1.2 meters thick, and it is broken by faults with a throw of up to 4 meters.

Before 1970 a combined system for excavating along the seam's strike with two tunnels 8 m^2 in inside cross-sectional area was used at the section. Length of the longwall in terms of the gas factor was 200 meters, and the daily workload was 500 tons. Coal was excavated with the 2K-52 cutter-loader, with individual Sputnik supports. The section worked on a 4-shift pattern and met the plan tasks. However, the regularity of the work was broken because of idle time for organizational, technical and mine-geology reasons.

The section's collective faced the task of increasing the workload per longwall to 1,500 tons per day under a three-shift work system. The collective coped with the task successfully: the average daily workload per longwall has risen more than 4-fold since 1970; labor productivity per worker engaged in mining has increased by 60 percent; idle time has been reduced to a minimum; and a multiple-cycle rhythmic organization of production and operations has been introduced.

In May 1981 a record for average daily mining from a longwall--2,534 tons--was set. Because of the gas-laden outburst-prone seam, this was a difficult task. It was necessary not only to select the correct direction for improving the operating technology and for organizing production and operations to take the achievements of scientific and technical progress and advanced experience into account but also to overcome a psychological barrier.

Work at the section began with engineering preparation for production--improvements in the excavating system and in mining-operations technology. The section was converted to the continuous system for excavating along the seam's strike and the laying, after the longwall, of three tunnels with inside cross-sectional areas of, respectively 14, 16 and 19 m^2--for air supply, ventilation and the conveyor. The rock from making the workings was left in the excavated space. The longwall was 350-400 meters long. It was equipped with a KM-87 longwall miner with two 2K-52 cutter-loaders and two SPM-87 conveyors. Fresh air was to be fed into the longwall along two side tunnels, while the outgoing stream was led off over the middle ventilation tunnel. The section was equipped with a bunker of up to 500 tons' capacity, for accumulating coal from the longwall. Anchor bolts supported the roof in areas of geological rock faults. The manual operations of unloading, loading and shifting of materials and equipment were mechanized--hydraulic lifters, monorailways and electric and pneumatic telphers were used. Questions of increasing the reliability of the minewide technological chain were solved simultaneously: the inside cross-sectional area of the main ventilation workings was increased to 25.8 m^2, the minewide scheme for ventilation was simplified, and a bunker of 2,500 tons' capacity was prepared for the whole mine, close to the skip bore, for accumulating coal. All this helped to raise the reliability of the section's technological teams, which was a most important requirement for insuring rhythmic organization of production.

The organizational tasks of providing for multiple-cycle rhythmic operation of all the section's technological teams were resolved simultaneously with the technical and technological tasks. A three-shift operation was introduced: the first shift was a repair shift, while the second and third were mining shifts, with an hour's interval between them. The three hours before the third and first shifts (the zero shift) were allocated for taking burst-prevention measures.

Work schedules for breakage and development faces were calculated very carefully with regard to resources and time. Experience has shown that leaving time "reserves" in work-organization schedules for cases of unforeseen interference in performing various operations is not desirable. Open time reserves are perceived by operating personnel as having been planned, which is telling on rhythmicity in organizing production and on work discipline. As the operators gain experience in performing the various jobs (operations), or as advanced experience is introduced, resources and periods are revised in later schedules in the direction of a reduction. The efforts of workers to shorten work schedules are given both material and nonmaterial incentives. For purposes of insuring the reliability of engineering substantiation of the work schedules for the section's engineers and technicians, the management system is continuously improved, and an effective system for monitoring the operations is developed, information about the progress of production

processes is gathered and analyzed, and possible interference with the work is forecast and measures taken to eliminate it.

The work pattern for the section's breakage and developmental faces is designed for each month. In so doing, the requirements for meeting the plan indicators and adopted socialist commitments within the available workdays is taken as the starting point. Under such a pattern for planning the work, there is no necessity for mining coal on Sundays. Such days should be used only for carrying out complicated repair and preventive maintenance work.

The work schedules are reviewed at a council of the brigades and at workers' shift meetings. During discussion of the schedules, special attention is paid to processes where there is a potential for work interruptions, and measures are worked out collectively for averting them, and the persons responsible for executing them are named. In this case, the section chief assumes responsibility for observance of the technology of the operations, for ongoing coordination of the officials' activity, for providing workplaces with resources, and for good quality of execution of the work to create safe working conditions for the miners. Mine foremen answer for organization of the work in shifts, observance of the safety rules, work discipline, work quality, production sophistication and fulfillment of the adopted commitments. The responsibility for effective organization of planned preventive maintenance of equipment and its correct operation is vested in the mechanical engineer and the section chief's assistants.

The figure shows a planning diagram for work at the longwall for four cycles per day. The schedule calls for combining production processes in time to the maximum. A team of 18-20 breakage-face mineworkers and 2 or 3 standby electrician-mechanics make up a mining shift. Coal in recesses is excavated by jackhammers simultaneously with the excavation of coal at the longwall, performed in advance of the longwall by 2.8-3 meters. Five workers are employed to dig coal at the lowest recess, 6 meters long, and 4 and 3 workers are employed to dig coal at the 9-meter long upper recess during, respectively, the second and third shifts. About 40 percent of the mineworkers' brigade are employed in excavating recesses and working to prevent sudden coal and gas outbursts, a fact that greatly reduces labor productivity and increases the prime cost for mining the coal. However, this is necessary for insuring safe working conditions.

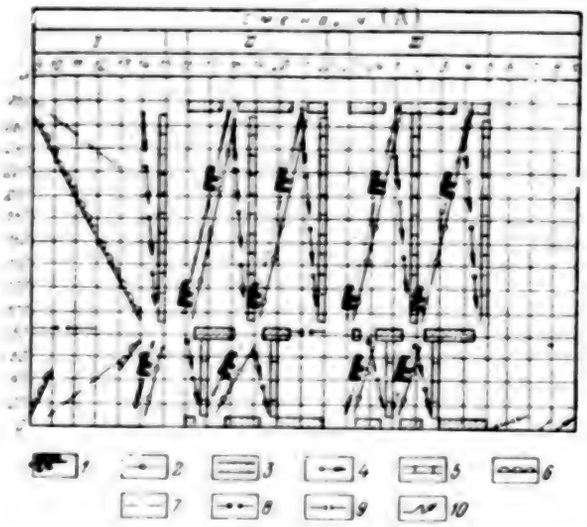
Successful operation of the breakage face in strict accordance with the schedule during mining shifts is supported by high quality of repair operations under the direct supervision of the mine foremen. During the repair shift (from 0800 to 1400 hours) two teams work at the longwall. One, made up of 12-16 highly skilled breakage-face mineworkers, is specialized in repair work. The other, made up of 10-12 mineworkers from the mining shifts, do repair work on a sliding schedule. All machinery in the section is earmarked for repair workers. Cutter-loader repair is performed by two equipment operators and two electrician-mechanics. Inspection and repair of the M-87 supports (replacement of hydraulically-operated posts, panels, jacks and suspension equipment) are carried out by two mineworkers for each 100 support sections. Two people cover and install chute and trimming blades and replace them, while four mineworkers cover and check conveyor chains and replace and level bent

scrapers. Four mineworkers per tunnel shorten or lengthen conveyors, and two mineworkers inspect and repair them. The remaining mineworkers do mining, and, where there is great wear of M-87 mine-support sections, they help the workers who are responsible for their condition to repair them.

Planning Diagram for Operations.

1. Excavation of coal by 2K-52 cutter-loader.
2. Advancement of support sections.
3. Excavation of coal in the recess.
4. Cutter-loader run.
5. Shifting of the SPM-87D conveyor.
6. Repair work.
7. Injection of water into the seam.
8. Creation of unloading openings.
9. Drilling of holes for torpedoing.
10. Explosion of the charges.

A. Shift, hours.



Simultaneously, a team of eight electrician-mechanics who repair machinery, mechanisms and electrical starters, work at the longwall. Each day they inspect the drive and tensioning heads of the conveyors, check reduction gear and turboclutches, scraper winches, and lighting and communications along the longwall, repair SNU-5 stations, and, jointly with the miners, they replace various equipment components that have been readied in the mine's mechanical shop in good time. In so doing, planned-preventive maintenance schedules for machines and mechanisms are strictly observed. The most labor-intensive repair work is done on Sundays.

Mine foremen assign workers to workplaces during mining shifts and the repair shift according to the amounts of work and the qualifications of the workers involved. All workers report to the mine foremen about fulfillment of the work and its quality. The responsibility for quality in performing mining and in repairing machines and mechanisms is vested completely in the workers who are designated as group leadermen and in the mine foreman.

Experience has shown that even where there is good equipment and favorable technological and mining conditions but labor discipline is low, stable production cannot be provided, so the section's management and activist workers do much to strengthen work and production discipline. First of all, organizational methods are used: those conditions (the amount of work, materials and tooling and organization and pattern of work) under which no worker can make an excuse for late execution or poor quality of the work are created at each workplace. This disciplines the workers, improves their attitudes, and they become convinced that a high level of discipline for everyone facilitates the work of each. Improvement of work organization, production and management in the section and constant training in advanced work experience imbue workers with a sensitivity for the labor collective.

Personal responsibility has been increased: mine foremen and brigade and team leaders report daily to the section chief or his deputy on the status of discipline in the teams, work quality, and idle time caused by a lack of resources at the workplace. Here, no one in the section escapes personal responsibility. Knowing this, the workers invest their efforts in coping with the assigned task and do not let the leaderman or supervisor down. Various measures for material and nonmaterial incentives are taken in concert for a conscientious attitude toward work.

Since 1978, the labor participation factor (KTU), which is recorded for all workers for each shift in a special book by the mine foreman and team leaders, is being used effectively at the section. A KTU reduction of as much as 0.6 or an increase of no more than 1.2 is authorized. The basis for reducing the KTU is nonfulfillment by the worker of special requirements, which include 26 items and are discussed in the labor collective and confirmed by the council of brigades.

An increase in KTU is authorized only for a special labor contribution to the collective's operation. For each worker (and team and brigade leader) the daily norm should be conscientious work, which is evaluated by the labor participation factor, which is equal to unity. When closing reports, the total number of shifts worked during the week (or month) by each worker is revised (reduced or increased), taking the KTU into account, and the revised figure is the basis for paying the regular wage and the bonus.

Granting the mine foreman and team leaders the right to determine the KTU for each team (or shift) member has raised their role and responsibility for the work. However, the council of brigades and section management monitor their activity and make decisions in conflict situations. If a worker's KTU has been reduced repeatedly, then his activity is reviewed by the council of brigades, which meets twice per month. The council members are all the team leaders, brigade leaders and members of the mine section's activist group, and the chairman is the leader of a continuous-operation brigade of breakage-face mineworkers. The section's engineers and specialists are invited to council meetings. The council of brigades can decide to reduce a worker's KTU, to reduce his rating for a period of up to 3 months in the established procedure, transfer him to lower-paid work for a specific time, and so on. The council can revoke its previous decision only after intervention by the mine foreman, the team leader or the section's management. It is precisely these measures, the section's personnel think, that explain the fact that there have been almost no substantial violations of labor discipline or of work-safety rules for a number of years in this laboring collective of more than 450 persons (one daily continuous-operation brigade of breakage-face mineworkers, five tunneling brigades, two brigades of electrician-mechanics and one mine-support workers' brigade).

Practice has shown that without an effective system for monitoring mine work, it is practically impossible to introduce rhythmic organization of production. The main things that distinguish the monitoring system that the section has worked out are comprehensiveness, responsiveness, activeness, good intentions and publicity. Four monitoring methods are used widely: preliminary, guiding, screening, and follow-up. The monitoring system is four-stage.

During the first stage, guiding monitoring is performed by the workers themselves during the production process. A procedure is established under which each worker bears material and moral responsibility for poor-quality work performance and for violations of PB [safety regulation] requirements that are committed during work performance by a fellow worker. Experience has shown that it is much easier to eliminate violations while production work is being done than at the completion stage. Moreover, implementation of the most effective method for guiding monitoring in coal-mining work is practically impossible without the involvement of a broad circle of workers, since engineers and technicians cannot be present at all workplaces at all times.

During the second stage, work performance is monitored by the mine foreman and brigade (and team) leaders. In so doing, the follow-up method of monitoring is applied, that is, the operations are monitored basically at the stage of their completion. The guiding monitoring method also is used during visits to workplaces during the shift. During the execution of especially dangerous work, the mine foreman or another engineer or technician is present and guides the operations of the operating personnel.

At the third stage, monitoring is done by the section's management. In this case all four methods are used: preliminary, for the purpose of finding out the situations that cause a setback of the prescribed production rhythm; guiding, for the purpose of evaluating the performance of organizational and monitoring functions by the mine foremen, and also observance of the operating technology by the operating personnel; screening monitoring with a view to studying the process of the functioning of the various technological teams; and follow-up monitoring, with a view to obtaining information in order to analyze effectiveness in the organization of production, work and management.

During the fourth stage, operations are monitored periodically in a planned procedure by special commissions, with the involvement of workers from other sections. In this case two methods are basically used--screening and follow-up. The status of work safety, industrial hygiene, and production sophistication are monitored, or advanced production experience is studied. The results of the monitoring are documented. The conclusions are reviewed at the council of brigades and at shiftworker meetings.

The results of current monitoring are examined daily between 1600 and 1730 hours at a production conference, at which the section chief, his deputy and assistants, the mechanical engineer, the mine foreman and brigade and team leaders are present. The meeting discusses factors that engender various violations and idle time and possible options for neutralizing them; the effectiveness of previously adopted decisions on averting interference in the work is examined; and an evaluation is made of the activity of officials and the effectiveness of the decisions they make. Each can defend his own point of view. The results of the discussion and the decisions that are adopted are not simply brought to the attention of the workers in shift orders but are discussed in reasoned fashion.

The effectiveness of the system for monitoring the conduct of mining operations depends greatly upon the section chief's personal execution of the

monitoring functions. His work should be an example for all the workers. The chief of Section No 2 visits the place where the mining is in progress five or six times per week, mainly during the first repair shift. He pays special attention to the work, poor-quality execution of which can prevent observance of the production rhythm. On each visit in the mine, the section chief carefully monitors the rectilinearity of the conveyors and the longwall face, the reliability of the longwall support in areas of geological faults, the correctness of the installation and the thrust of sections of the M-87 supports, the quality of the outburst-prevention work, and the quality of and the parameters for making tunnels after the longwall. If he detects deficiencies in work organization, the control of which is within the competence of the mine foreman and the team leader, he suggests that they analyze the existing situation and prepare measures to eliminate them. Intervention is allowed only in case a breakdown can lead to serious consequences. But at the meeting, the decision of the mine foreman and the team leader will mandatorily be discussed and an effective variant found jointly by all present. The section chief's personal monitoring does not pursue the aim of finding violators and punishing the guilty--the main thing is to teach the people to do more thinking and to find ways for effective and safe operation.

The section chief shows his confidence in operating personnel in many ways: by delegating responsibility with precision, and by granting broad authority to mine foremen and to the system for monitoring, for holding conferences, for reporting and for holding workers' meetings. In this regard, the system for ordering work that the section uses deserves attention. Its singularity lies in the fact that the on-duty mine foreman sends information by telephone about the status of operations at the end of the shift in accordance with a strictly defined model, not to the section chief but to his colleague, who reports in a special book on the actual state of affairs at workplaces, solves questions of organizing the work, assigns workers to workplaces in accordance with the prescribed rhythm, and concerns himself with supporting normal operation during the following shifts. The section chief or his deputy coordinates the activity of the brigades, pays attention to possible difficulties in the work, and conducts briefings on the rules for safety when carrying out various operations, and analyzes cases of violations of the TB [accident-prevention precautions] and the technology of the operations.

The sections pays daily attention to matters of organizing socialist competition. The tasks of engineering support for production, improvement of its organization, and strengthening of work discipline are solved creatively. All suggestions and ideas are widely discussed by the collective, and initiative is always encouraged. The organization of competition has been based upon publicity, and the criteria for evaluating the work results of its participants have been defined precisely.

Socialist commitments by the collectives of brigades and the section are adopted by month, quarter and year. However, competition results are summed up not only upon expiration of the indicated periods but also for each shift, since fulfillment of the plan for making excavations and for mining coal and fulfillment of the shift (and daily) commitments, which emanate from annual, quarterly and monthly commitments, are called for by the daily schedules for the work at development faces and longwalls. When the goals of the adopted

socialist commitments are not met, the operating rhythm of the section is violated, and this is completely intolerable. Therefore, accident-free, conscientious work under strenuous work schedules are taken as the criterion for the monthly assessment of the contribution of those who are competing to fulfill socialist commitments. This arouses the activity of workers, engineers and technicians and helps in the manifestation of initiative and enterprisingness.

Daily provisioning for rhythmic work of all the technological teams is one of the important factors in effective operation of the section. More than 10 of the section's collectives fulfill socialist commitments each month. In the year 1983, 567,100 tons of coal were mined, the labor productivity plan was fulfilled 107.4 percent, and the average daily workload per longwall was 1,587 tons.

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MODELS FOR SYSTEMS ANALYSIS OF COAL MINES, REGIONS OUTLINED

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[Article by P. I. Marosin, deputy UkSSR Minister of Coal Industry: "Models of an Underground Coal Mine and of a Region"]

[Text] Mathematical-economics models (EMM's) are used in determining optimal parameters for individual mines and in optimizing technical and economic decisions within a basin or the industry. Their purpose is to establish more effective final indicators (usually capital investment and operating expenditures or the prime cost of mining coal) as a function of a mine's basic parameters.

However, such models have the following deficiencies: they are unwieldy, since numerous factors affect the final indicators, and introducing them directly into the model greatly complicates it; they do not reflect the dynamics of mine development, since the time parameter is not entered into the model; and the mine's structure as a system, which is of considerable importance when the dynamics of its development are being studied, is not accurately reflected, since the various processes and the expenditures associated with them differ strongly in the nature of their dynamics during the various periods of the mine's operation.

Work [1]* describes an EMM that is based upon an analysis of the mine's operating structure. This work's author examines the mine as a dendritic multiple level system, at the bottom level of which the primary elements are the breakage faces--the sources of flow of the mined mass, and then come the next levels with the mine-excavation systems and the operating complex at the surface, which are devoted to transport and ventilation lines. The elements of the next level are the minewide processes (the main water-removal system, degassing, gobbing, the buildings and structures on the surface, and so on).

The starting point of the calculations is the volume of the flows of mined mass from the breakage faces, and, at the last step, the economic variable values are determined for each level: capital investment, prime production costs and labor intensiveness. This model also is not devoid of observed deficiencies.

Representation of the mine as a dendritic structure is irrational, since the processes that support normal mine operation (ventilation, water removal, the

*Translator's note: No bibliography was printed at the end of this article.

repair activity, and so on), operate simultaneously with the main process and, to a certain extent, independently.

The EMM in this form, in which it is now made up, combines within itself two diverse elements: the technological and the economic parts; although the first serves as the initial base for the second, each is controlled by its own laws and limitations and are, to a certain degree, independent. Moreover, the necessity for an independent examination of technological factors independently of the economic factors can arise; where the tie between the technology and certain economic indicators is simple and unambiguous, one can restrict oneself to an examination just of the technological part, in order to simply the computations.

For these reasons it is desirable (this was first noted in the works of TsNIEIugol' [Central Scientific-Research Institute for the Economics and Scientific and Technical Information about the Coal Industry] by L. A. Kaforin) to divide the mine's model into two: the mathematico-technological model (TMM) and the mathematico-economics model. The first describes the dynamics of mine development as a technical system and, depending upon the assigned mission, has a corresponding depth of study. With a maximum amount of the latter, the TMM has for output, data about work volume that are adequate for determining economic indicators. The EMM studies the levels and dynamics of the technical and economic indicators, the TMM serving as the main source of input information for the EMM.

For the individual mine, a TMM and an EMM are developed. For a region or basin or the industry, it is the EMM, since at these levels the factors that formed the value of the enterprise's technical and economic indicators no longer have meaning, but the level of these indicators and changes in the structure of the region or the branch and duration of the computed period are important.

The basis for creating the TMM is a representation of the mine in the form of a large system that is marked by the following attributes [2]: the presence of independent subsystems in a definite degree; the presence of a dependency between relatively independent subsystems; and a hierarchy of the subsystems. Functional characteristics of the subsystems must be added to these attributes, which describe the structure of the system.

According to work [3] the mine is a fusion of three types of subsystems: the basic production process, preservation of the system, and development of the system. The first type of subsystem should include breakage and development operations, as well as transport of useful mineral from the longwall until it is loaded into railroad cars; since the useful mineral is mined at the breakage faces, operational transport is an inherent part of the production process.

The preservation subsystems include sections that do not produce the basic product but their work is necessary for normal mine functioning. Development subsystems include capital-type mine-development excavations. These developmental workings, which combine all three types of functional mine subsystems, occupy a special position. They are the place for mining a certain amount of

useful mineral, the trunk lines for transporting it (the basic production process) and lines along which people, materials, equipment and rock are transported and air is moved (the preservation system), while workings of a developmental nature are the development subsystem. For the predominant purpose, it is desirable that the network of mine workings of an operating nature be included in the basic production-process subsystem, the network of capital-type mine workings in the development subsystems.

More numerous at the mine are preservation subsystems, which can, in turn, be subdivided into two groups: those that directly affect the main production-process subsystems (ventilation, the repair of workings, degassing, air conditioning, moistening of the coal in the solid body, measures in the drive against coal and gas outbursts), and those that maintain the functioning of the system (water removal, equipment repair, auxiliary transport, and the operating complex on the surface, in addition to the transport of useful minerals, electric-power supply and communications).

The mine as a system is a unified aggregation of three simultaneously operating groups of subsystems, which interact differently among themselves according to the principles of direct coupling and feedback but are subordinate to the main purpose of functioning of the system--to the mining of useful mineral at a definite level of technical and economic indicators.

Each subsystem has the following attributes that separate it from the others and which impart to it a certain degree of independence: a definite and permanent chief purpose of the subsystem; the predominance of a static or dynamic nature of the subsystem; and the existence of one or several main quantitative indicators for the system.

Interaction among the mine's subsystems is of a continuous-discontinuous nature, and this occasions a difference in the dynamics of the subsystems. Breakage-face and operating preparatory workings change continuously, a fact that predetermines input signals to other subsystems. Feedback, except for ventilation, is always discrete. Preservation subsystems perform their functions as long as their capacity or throughput is adequate. In the opposite case they should vary spasmodically, otherwise the basic production process will be disturbed.

The enumerated properties of mine subsystems occasion the following prerequisites, which must be adopted when constructing TMM's:

one or more gages (or criteria) can be chosen to describe the dynamics of the individual processes; in particular, these gages are constant and the process is of a completely static nature;

a small number of primary factors (as a rule, those that are necessary for building a model for breakage-face operations) should be adopted as the gages (or criteria), and the other processes should be correlated to these factors or to the breakage faces as a whole;

the dynamics of all the processes are examined during a definite computational period T, the duration of which is established as a function of the purpose of the study;

at the initial moment (T = 0), the gage (or criterion) for a given process has a definite value and, in particular, it can be equal to zero; and

in accordance with the scheme for constructing TMM's, the following list of processes X_j is assumed: breakage face operations X_1, developmental work X_2, transport of useful minerals X_3, ventilation of mine workings X_4, repair and upkeep of mine workings X_5, degassing X_6, air conditioning X_7, moistening coal in the solid body X_8, the drive against sudden outbursts of coal and gas X_9, water removal X_{10}, repair of underground equipment X_{11}, auxiliary transport X_{12}, general mine maintenance X_{13}, power supply X_{14}, communications X_{15} and the surface activity (except for the transport of useful mineral) X_{16}.

A most important element of the TMM is the system of restrictions. A prerequisite to normal mine functioning is the fact that for each process the output value of a given gage (or criterion) should be no more (or no less) than the desired output.

Taking what has been said into account, the conceptual model for each process X_j for a selected k-th gage (k = 1, 2, ..., m) can be presented in the form

$$X_{kjt} = X_{kj0} + X_{kj}(t) \qquad t = \overline{0, T} \tag{1}$$

given the restrictions

$$Y_k(t) \leqslant \mu_k \vee Y_k(t) > \mu_k; \tag{2}$$

$$Y_{kj}(t) \leqslant \mu_{kj} \vee Y_{kj}(t) > \mu_{kj}. \tag{3}$$

where X_{kjt} is the value of the k-th gage (or criterion) at the moment t for the j-th process, $j = \overline{1,16}$; and $X_{kj}(t)$ is a function of the dependence of the value of the gage (or indicator) during the computed period T; it is assumed that where $t = 0$ $X_{kj}(0) = 0$, then $X_{kjt} = X_{kj0}$; $Y_k(t)$ is the output value of the k-th gage (or criterion) for the mine at the moment of time t; $Y_{kj}(t)$ is the output value of the k-th gage (or criterion) for the j-th process; μ_k is the established (or permissible) value of the k-th gage (or criterion) for the mine; and μ_{kj} is the established (or permissible) value of the k-th gage (or criterion) for the j-th process.

Construction of the model consists in determining $X_{kj}(t)$ as a function of time and other primary factors. The excavation floor, the seam, the horizon, the block or the mine can be examined as a function of the adopted computational period.

The dynamics of the X_6, X_7, X_8, X_9, X_{14} and X_{15} processes correspond in the underground portion to the dynamics of the breakage and preparatory operations, and so the expenditures on the six enumerated processes can be joined as definite additions to the expenditures for breakage and preparatory operations.

The discrete and static nature of some processes (X_{10}, X_{11}, X_{13} and X_{16}) is sharply expressed. As a rule they are calculated on the basis of the expected maximal workload and are retained for a substantial length of time, until major changes occur at the mine (transfer to a new horizon or another block, adjustment of reserves, change in the stripping method, and so on).

For these processes, equation (1) acquires the simplest form

$$X_{kjt} = \mu_{kjt} \text{ for } t \leqslant t_l \in \overline{0, T}. \tag{4}$$

where j = 10, 11, 13 and 16; t_l is the time interval within the chosen period T, as long as the throughput μ_{Kjt} is adequate.

For example, for the chief water removal subsystem (j = 10), we choose total pump capacity and the corresponding motor power as the criterion k and assume that during the first 15 years after start of the computational period, that is, while $t \leqslant t_l = 15$, it will have adequate power, 700 kW, and this will have to be increased to 1,200 kW in the next 20 years; then equation (4) can be written in the following form:

$$X_{k10t} = \begin{cases} 700 & t \leqslant 15 \\ 1200 & 16 \leqslant t_l \leqslant 35. \end{cases}$$

For processes that consist of different complexes, for example, the general mine service and the surface activity, it is possible to choose several gages (service capacity of the administrative and domestic-services combine, compressor-station feed, and so on) or one generalizing gage, for example, total cost of fixed capital, and then we get one or a system of equations of the form (4) for intervals of time that correspond to each process or to the complex that enters into it.

The depth of the differentiation within these processes is taken as a function of the purposes of the study or the significance of the complexes under specific circumstances.

As a consequence of the simplicity of the equations for the processes X_{10}, X_{11}, X_{13} and X_{16}, the expenditures on them can be introduced directly into the EMM. In accordance with what has been said, out of the 16 processes, 5--X_1, X_2, X_3, X_4 and X_{12}--must be examined in greater detail and independently.

Let us dwell first of all on ventilation of the mine workings X_4. This process has two components: the equipment, structures and devices necessary for ventilating the mine workings (fans of all types, excavations designed for ventilation alone, for example, holes, connectors, doorways and so on) and the ventilation itself, that is, the placement of the air about the workings.

The amount of air that should pass along the mine working is one of the restrictions. The ventilation process is continuous, various ventilation devices are distributed about the mine workings in accordance with the adopted systems for mine development and other specific conditions, and the expenditures connected therewith can be joined in the form of additions to the cost of making the excavation. As for the equipment, ventilation holes and other similar discrete objects, type (4) equations can be made up for them.

In order to construct models for the four remaining processes, the mining capacity of the mine and the number of breakage faces, which also predetermines the loading per longwall, are taken as baseline parameters.

The stripping method, the scheme for preparation and systems for excavating are assumed to be what has been prescribed. These tasks can be rigidly stipulated, for example, for an operating mine, or they themselves be objects of variation, for example, in the search for optimal solutions. In the latter case, the necessary optimization is carried out by surveying the options or by a direct analytic expression for the output data as functions of the basic parameters.

The conceptual model for breakage-face work, if distance of the breakage faces from the shaft is taken as the gage (or criterion) of the X_1 process, can be presented in the form

$$X_{kit} = v_i(0) + v_i(t), \quad i = 1, 2, \ldots, n, \; t \leqslant T \tag{5}$$

given the restrictions

$$v_i t \leqslant L; \tag{6}$$

$$\alpha l_i \leqslant h \vee v_i t \leqslant h; \tag{7}$$

$$Д_t = \sum_{i=1}^{n} q_{it}, \; t = \overline{0, T}; \tag{8}$$

$$\sum_{i=1}^{n} q_{it} \leqslant Z_t, \; i = \overline{1, n}, \tag{9}$$

where i is the number of the longwall, i = 1, 2, ..., n; n is the number of longwalls; and v_i is the rate of advance of the i-th longwall, in meters per unit of time; and

t is the time from the start of the report, but within the restrictions of the computational period, L and h are the dimensions along the strike and dip of the block, seam, horizon or shaft being excavated (subscripts are added respectively, б, п, г and ш); l_i is the length of the i-th longwall, i = $\overline{1, n}$; α is the number of longwalls within the floor being excavated along the dip; $Д_t$ is the mining of coal for the mine in the t-th year; q_{it} is the mining along the i-th longwall in the t-th year; T is the computational period; and Z comprises the industrial reserves of the portion of the mine floor that is being examined.

The restriction (7) is given in two forms, joined by the sign $\vee$ (OR), the left side of which corresponds to the depleting of breakage faces with long pillars along the strike, the right side with long pillars along the dip (or rise).

Having given definite values to t under the chosen scheme for developmental work and under the system for excavation, we establish the position of the breakage faces in space, which enables us to transfer to the construction of a more complicated model for developmental operations and the network of support workings. For this purpose, developmental workings are divided into groups according to their position relative to the breakage faces.

Let us designate the index of the group as j, and its value will vary from 1 to the number of groups p. In the first approximation, let us take 8 groups of

workings: tunnels directly adjacent to the longwalls, j = 1; floors and tunnels along seams not being worked, j = 2; panel tunnels and tunnels similar to them, j = 3; sloped workings, j = 4; main and block crosscuts, j = 5; intermediate crosscuts, j = 6; ventilation tunrels not adjacent to longwalls, j = 7; and the remaining workings--pillars, doors near pillars, cuts, bunkers, and so on, j = 8. In each group there can be an i_j working, and the total number of developmental workings for the mine is

$$N = \sum_{j=1}^{p} \sum_{i=1}^{i_j} i_j. \tag{10}$$

Workings can also be numbered by a continuous index, which will vary from i = 1 to i = N.

If the necessary amount of developmental workings is taken as the criterion (or gage) for developmental workings, then the conceptual model for this process can be presented as follows:

$$X_{zkt} = L = \sum_{t=1}^{T} \sum_{j=1}^{p} \sum_{i=1}^{i_j} (l_{0ij} + \alpha_{ijt}) k_{jt} n_t \tag{11}$$

given the restriction

$$S_{ij0} \geqslant S_{ij\Phi}. \tag{12}$$

where L is the total length of the working made during the computational period T; l_{0ij} is the total length at the start of the computational period (t = 0) of the i-th working in the j-th group; α_{ijt} is the increase in the length of the i-th working of the j-th group per unit of time in the t-th year; k_{jt} is the ratio of the number of workings of the j-th group to the number of breakage faces in the t-th year; S_{ij0} is the cross-sectional area assumed (or computed) for the i-th working for the j-th group; and $S_{ij\Phi}$ is the cross-sectional area of the same working that is necessary for the transport or ventilation conditions.

In this model, the coefficients α_{ijt} and k_{jt} depend upon the scheme of development, the systems of excavation, and the speed of advance of the breakage faces, and they can vary with time or maintain a constant value.

In particular, for workings directly adjacent to longwalls, α_{ijt} is equal to the rate of advance for breakage faces, and for isolated ventilation and solitary longwalls k_{jt} = 2. For other groups of workings, these coefficients are based upon the average breakage-face rate of advance.

The pace of making workings is computed on the basis of equation (11), as a function of those periods during which the workings should be made. Under formula (11), after substituting the value of the cross-sectional area of the working, the amount thereof can be determined. Similar models are made up for underground transport and the maintenance of the mine workings.

The mathematical-economics model (EMM) determines the amount of the expenditures for obtaining output during the computed period, although in principle an EMM can also be built for a different purpose, for example, for studying the dynamics of the fixed capital, but here only an EMM for determining capital investment and operating expenditures is being examined.

The conceptual model for capital investment can be presented for the established period T since the start of construction in the form

$$K = K_0 + \sum_{i=1}^{i=m} \sum_{t=t_{1i}}^{t=t_{2i}} K_{ti} + \sum_{t=1}^{t=T} K_t \qquad (13)$$

$$(t_{1i}, t_{2i} \in T \qquad i = \overline{1, m}),$$

where K_0 is the capital investment for building the mine, and for existing mines $K_0 = 0$; K_{ti} is the one-time capital investment for the preparation of new horizons, blocks, the driving of pillars, transfer to new seams, and other measures; i is the index of measures with the capital investment K_{ti}; m is the number of such measures for the computed period T; K_t is the capital investment spread out in time (annual investment for the upkeep of capacity); and t_{1i} and t_{2i} are, respectively, the start and completion of the i-th measure.

On the basis of the amounts established during development of the TMM, the capital investment form for each of the processes is determined in accordance with consolidated indicators or analogs during the period T. Depending upon whether the mine as a whole or a part of it is being examined, the expenditures obtained are included in the first or the second term of formula (13). The third term usually is determined in accordance with the standards, although it can be computed according to the TMM, as is the case also for the first two terms.

Operating expenditures during the period T are changed practically proportionally to the time with a certain trend to growth in view of complication of the layout of the mine workings, if this trend is not neutralized by reconstruction or a technical improvement.

Assuming a small randomness, it should be considered that operational expenditures (the prime cost of mining the coal) are formed by three main factors: the capacity of the mine, labor productivity and the cost of the fixed capital, so the conceptual model for operating expenditures for the period T being computed can be represented in the form

$$Э_T = \sum_{t=1}^{t=T} [f_t(Д_t) + \varphi_t(P_t) + F_t(\Phi_t)]. \qquad (14)$$

where $Д_t$, P_t and Φ_t are, respectively, mining, labor productivity, and value of the fixed capital in the t-th year; f_t, φ_t and F_t are functions of the dependence of operational expenditures on the indicated independent variables; and $Э_T$ are the operational expenditures for the period T.

The prime cost in the t-th year is determined according to the formula

$$C_t = \frac{Э_t}{Д_t}, \qquad (15)$$

where $Э_t$ are operational expenditures for the t-th year.

The capacity of the mine affects labor productivity and fixed capital, but, for a given capacity, these two factors determine expenditures on wage funds with charges and on writeoff, which comprise 70-75 percent of the whole prime cost. The remaining expenditures (materials, fuel, electricity and other monetary expenditures) are functions of the mine's capacity and numerous factors, of which the following should be noted: depth of excavation, geographical position, degree of improvement of the repair base, nature-conservation measures, and so on.

In practice, the search for the values of the functions in formula (14) comes down to determining expenditures by element of the prime cost that corresponds to each of the functions, and it does not present major difficulties, since the required standards exist or designs that have been executed can be used directly as analogs or with certain adjustments.

The EMM's for various mines serve as a source material for optimized evaluations for a region, a basin or the industry, since they enable capital investment and operating expenditures to be commensurate, and, in so doing, the choice of criterion becomes of the greatest importance. In optimizing the calculations, not enough attention has been paid yet to the infrastructure, regional facilities and expenditures on nature-conservation measures and on compensation for the temporary effect of mining operations, although in some cases they are of considerable importance.

The widely spread method of computing expenditures on infrastructure and on regional facilities through apportionment for shared participation among the corresponding enterprises does not reflect the true dynamics of capital investment, for two reasons: the construction of these facilities should precede (completely or to a great extent) the erection of the main enterprises; and facilities of the infrastructure depend poorly upon the parameters of the individual enterprises, for they are determined by the number of the latter, their mutual location, and the degree of industrial mastery of the region. So the cost of regional facilities depends greatly upon their numbers and the sequence of construction.

Among nature conservation measures, the problem of cleaning the highly mineralized mine water, which cannot be thrown even into large rivers or ponds, should be dwelt upon. The demineralization technologies are extremely poorly perfected today, and they are capital intensive and require large energy expenditures.

The protection of the earth's surface from undermining and flooding and the necessity for moving communities and industrial enterprises and for preserving valuable agricultural land and forests can be of considerable significance. For example, when the prospects for developing the Western Donbass were

being worked out, it became necessary to refrain from constructing certain mines or to reduce their capacity, which was stimulated by the needs of nature conservation.

The model and the conceptual situation that are set forth in this work can be realized for individual enterprises in various ways: in the form of analytical functions or a system of tables which contain data about the dynamics of expenditures in regard to time; computers are used to optimize the calculations.

A check of the model was carried out in the example of a new coal region, the Western Donbass. The prospects for developing the Blagodatnaya Underground Mine of Pavlogradugol' [Pavlograd Coal Production Association] over a long period (40 years) were examined for two mine development-scheme variants. One of them assumed the successive depletion of suites of seams within one block, with later transfer to a second block, while the other assumed depletion of each suite of seams on the strike of two blocks with later transfer to depletion of a second suite of seams, and so on. The first variant proved to be more desirable after a check for several criteria.

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UDC 621.879.48"ERShRD-5000"001.42:622.33.012.3"Ekibastuzugol'"

NEW SET OF COAL STRIP-MINING MACHINERY PASSES TEST

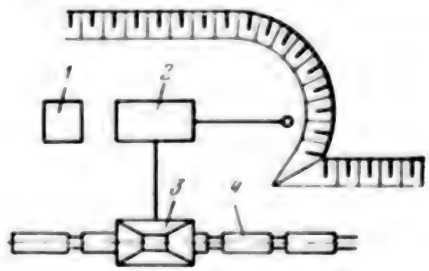
Moscow UGOL' in Russian No 2, Feb 84 pp 23-24

[Article by Candidate of Engineering Sciences A. I. Shenderov (NKMZ [Novokramatorsk Machinebuilding Plant imeni V. I. Lenin]), Engineer A. P. Ziborov (Dnepropetrovsk Branch of VNIPIrudmash [All-Union Scientific-Research and Design Institute for Mine Machinebuilding]) and Candidate of Engineering Sciences V. V. Guzhovskiy (UkrNIIproyekt [Ukrainian Scientific-Research and Design Institute for the Coal, Ore and Gas Industries]): "The Results of Industrial-Test Operation of the ERShRD-5000 Rotary Complex"*]

[Text] The ERShRD-5000 complex was intended for year-round operation at coal fields of East Siberia and North Kazakhstan. It consists of the ERShRD-5000 30/3 rotary excavator, the self-propelled SPU-5000 loading facility and the self-propelled SKP-1200/1000 cable mover (see figure).

The Complex's Operating Scheme.

1. ERShRD-5000 30/3 rotary excavator.
2. SPU-5000 loading facility.
3. Self-propelled SKP-1200/1000 cable mover.
4. Freight car.



This equipment provides for the excavation of hard bituminous coal of complicated structure and the continuous loading thereof, apportioned by weight, into MPS [Ministry of Railways] railroad cars that are delivered over two railroad tracks.

The excavator and the loading facility were created by the Novokramatorsk Machinebuilding Plant (NKMZ) imeni V. I. Lenin, the cable mover by the Zhdanov Heavy Machinebuilding Plant (ZhZTM). UkrNIIproyekt, KIA, the IGD [Institute of Mining imeni A. A. Skochinskiy] and other institutes took part in creating this equipment, in addition to the manufacturing plants.

*Engineer R. S. Shmerkovich (of UkrNIIproyekt) took part in the preparation of this article.

Specifications of the Rotary Excavator

Theoretical productivity in broken-up bulk material, m³/hr	5,000
Rotor diameter along the cutting edges, meters	13
Number of buckets	16
Rotor rotating frequency, rpm	3.5-5.0
Maximum cutting radius, meters	65.9
Width of stope, meters	90
Height of upper scooping, meters:	
With horizontal cuts	32
With vertical cuts	40
Depth of scooping, meters	3
Type of undercarriage equipment	Stepping, rail
Weight, tons	4,700

The loading facility weighs 970 tons and its bunker capacity is 120 m³.

During the period of industrial-test operation of ERShRD-500 No 1 by UkrNIIproyekt, with the participation of NKMZ imeni V. I. Lenin, instrumented studies of the excavator were carried out for more than 100 operating modes, under both ordinary operating conditions and extreme conditions: cutting across a bench, planing its floor, gathering, and so on. The purpose of the studies was to compare the actual level and nature of the load of the main drives, mechanisms and structure members and also their dynamic characteristics, with the accepted calculated values for operating the excavator under the mine-geology conditions of the Bogatyr' Strip Mine. Moreover, constant observations were made over a long period of time of the complex's operation. Doing so enabled indicators for operating reliability of the main components of the machines and of the complex as a whole, and also the breakdown of the calendar time, to be established.

The coal-and-rock face that was worked by the excavator during instrumented measuring was the central part of coal seam No 3, of 45-percent ash-content coal. Structurally, the solid mass to be mined was characterized by frequently alternating thin layers of coal and carbonaceous rock with a toughness coefficient of f = 1.3 to 3 on Professor M. M. Protod'yakonov's scale. The weighted-average value of the hardness coefficient at the parts of the block being excavated were within the range f = 1.9 to 2.3, including hard interstratification, with f = 4 to 7 and a thickness of 0.15-0.7 meter. Excavation of the mine face of unbroken structure (in the solid body), which had first been weakened by drilling and blasting, was made with vertical and horizontal cuts. The excavator's dynamic characteristics were determined by means of a calibrating pulse created by a microexplosion in accordance with the method of O. B. Slutskiy (UkrNIIproyekt).

While performing the research, it was established that all the machine's kinematic, power and dynamic characteristics corresponded to those calculated. Thus, the frequency spectrum for free oscillations of the load-bearing structure had been placed in the low-frequency zone of 0-14 cycles per second, and the higher frequencies were greatly dampened. With excitation of the structure in the vertical plane, the following free-oscillation frequencies

appeared: 3.5, 4.5, 8.5, 9.5, 11.0, 12.5 and 13.3 per second, while excitations in the horizontal plane were 1.75, 8.5 and 9.5 per second.

The frequencies of 1.75, 8.5 and 9.5 per second that were observed in the various planes characterize a three-dimensional form of oscillation. The frequency of 4.5 per second is close to the partial frequency of free oscillations in the vertical plane of the unloading boom.

During an analysis of the experimental data, a more rational pattern for excavator operation was established. Thus, in order to avoid the development of resonance vibrations, it was recommended that the rotor rotate at a frequency within the range of 70-74 dumpings per minute.

The loads on the drives for the rotor and the mechanism for rotating the upper structure during the excavation of the coal-and-rock block that was adopted for the instrumented measuring did not, as a rule, exceed those computed. The value of the parameters of the load on the rotor while making vertical cuts are shown in table 1 for three of the more representative sections of the block.

Table 1

Condition of the mine face	Average weighted resistance to scooping, K_F, MPa	Productivity, Q, m^3/hour	Circumferential force on the rotor, kN		Lateral force on the rotor, kN	
			P	P_M	P	P_M
Solid mass	1.7-2.3	3,000-2,000	310-360	430-750	220-240	280-320
	1.4-1.6	3,500-3,000	300-340	450-490	240-260	300-340
After drilling and blasting	1.0-1.1	4,500-5,000	320-360	380-420	100-140	140-200

Note. P is the mathematical expectation of the load.
P_M is the maximum value of the load, which is determined as $P_M = P + 2\sigma$ (σ is the average standard deviation).

When making horizontal cuts, the load of the rotor and turning-mechanism drives, and also the coefficient of the dynamicity of their load, was 1.15-fold to 1.25-fold higher than during vertical operation.

The total loading (static and dynamic) on important members of the load-bearing structure did not exceed the calculated values. Greater amplitudes of dynamic stress from induced oscillations (up to 30 MPa) were manifested in rotor-boom members, chiefly in the ties of the rhombic web of the vertical and horizontal girders. Additional stresses that reach 30-70 MPa also arise in the boom's root cross-section. In other components of the load-bearing structure members, the level of variable stresses do not exceed 20 MPa.

The rotor's dynamic motions during normal operation were 10 mm in the vertical and 30 mm in the horizontal planes, which testifies to the adequately high rigidity of the excavator's overall design. The level of dynamic motion during vertical cutting was 1.5-fold to 3-fold lower than during horizontal cutting.

The lumpiness of the solid mined mass that is permitted for the unloading conveyor under the existing standards (up to 300 mm) is provided by a rotary-type crusher on a rotating platform that is built into the unit for transferring the load from the rotary boom's conveyor.

During industrial-test operation of the excavator, certain of its components were improved: the structure and method for attaching the bucket teeth were improved; the rigidity of the rotor-drive frame was increased; the reliability of attachment of the crusher's hammers was raised; the seal of the conveyor track was improved, especially at transfer points; the component for transferring the solid mined mass from the rotor to the conveyor was rebuilt; a new scheme was used for suspending the rotor operator's cab that prevented oscillations thereof in the horizontal plane; and the design of the gate of the loading facility was improved.

Thus, basic deficiencies that reduced the complex's utilization effectiveness were found and eliminated to a great extent. A study of the reliability of the complex that was carried out during the industrial-operation period enabled the value of the readiness coefficients of its machinery to be determined (table 2).

The probability of breakdownfree operation of the complex and of the included machines and of the basic equipment was described satisfactorily in most cases by the exponential law of distribution.

Table 2

Equipment	Coefficient of readiness during	
	Summer	Winter
Complex as a whole.....	0.883	0.707
ERShRD-5000 excavator..	0.899	0.726
Loading facility.....	0.980	0.965

The reduction in the readiness coefficient during the winter that is characteristic of the equipment occurs basically because of increase in the labor-intensiveness of the work to reduce downtime. Thus, the average time for eliminating a breakdown in the summer is 35-40 minutes, while in the winter it is 100-110 minutes.

Operational tests of the complex (the rotary excavator, the loading facility, and the rail transport) showed that introducing the loading facility into the operating chain enabled additional time losses connected with placing the material into cyclic-type transport equipment to be completely precluded and provided for operation of the rotary excavator within the limits of its technical and operational potential.

The study and the operating results showed that the complex as a whole, in its constructional, kinematic and strength parameters and dynamic characteristics, the throughput of the transport lines, the level of load on the main mechanisms, and the reliability indicators, corresponds to the specifications and can be used successfully in the Ekibastuz Coal Basin environment.

The results that were obtained by the complex's industrial-test operation will enable paths for further increasing its operating productivity to be planned. Necessary for this are: improvement of the method and means for technical servicing and development of the repair services of enterprises that will use

the indicated equipment; improvement of work organization by way of greatly reducing idle-equipment time caused by a lack of transport facilities and operational and organizational factors; the commencement of work on developing methods for diagnosing the status of the equipment, primarily of the load-bearing metal structure and the chief mechanisms; refinement and mastery of the industrial production of reliable equipment for protecting the excavator's important mechanisms and load-bearing structure from overloads; continuation of work to raise the wear resistance and impact resistance of the cutting members; and resolution of questions associated with automation of the loading process. The solution of these problems will enable complexes of this type to attain a productivity of 12 million tons of coal per year.

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PIPELINE CONSTRUCTION

OIL, GAS INDUSTRY 1984 SOCIALIST COMMITMENTS REVIEWED

Moscow STROITEL'STVO TRUBOPROVODOV in Russian No 3, Mar 84 pp 2-4

[Article: "Socialist Commitments of the Organization and Enterprise Collectives of the Ministry of Construction of Petroleum and Gas Industry Enterprises for 1984"]

[Text] The workers of the sector, in fulfilling the historic resolutions of the 26th Party Congress, the November (1982) and June (1983) CPSU Central Committee Plenums, are unremittingly carrying out the party line for raising work efficiency and quality and reinforcing discipline and order at the production site.

Due to the selfless labor of the workers, engineering and technical personnel and office workers during the past three years, the necessary prerequisites have been established for successful fulfillment of the goals of the 11th Five-Year Plan as a whole. The program for construction and installation work has been fulfilled in the amount of 14.1 billion rubles, which is 105.2 percent of the established amount. The growth rates of labor productivity in construction have more than doubled. The most important projects, which determine the intensive development of the oil, and especially of the gas industry, are being put into operation at advanced rates. The main result of the third year of the five-year plan was putting into operation ahead of schedule the gas pipeline Urengoy-Pomary-Uzhgorod. This labor victory was highly valued by the CPSU Central Committee and USSR Council of Ministers.

In response to the resolutions of the December (1983) CPSU Central Committee Plenum, and in striving to make their contribution to fulfilling the tasks posed, many collectives of the sector's organizations and enterprises came forth with patriotic initiatives for putting the construction projects into operation ahead of schedule, raising labor productivity and achieving high economic results.

Having developed mass socialist competition for fulfillment of the plans for economic and social development in 1984 and putting into effect the USSR Power Engineering Program, the sector's workers are adopting the following socialist commitments.

On the basis of improving production organization, introducing highly productive techniques, automating production processes, reducing manual labor, reinforcing discipline and reducing losses of work time, due to a counter plan, to increase labor productivity in construction by 1 percent, reduce production cost by 0.5 percent and due to this, to fulfill ahead of schedule the planned goals for 1984. In industry, to ensure the growth of production by virtue of achieving the planned labor intensiveness and growth of labor productivity.

To implement the set of measures for further technical reequipment of the organizations and acceleration of scientific-technical progress. To carry out the research, design, planning and experimental work for 200 promising developments.

To test the experimental model of a rotary excavator to dig fully-shaped trenches in permafrost. To manufacture at least 15 units of transport-installation devices on an air cushion.

To expand the use of automated welding methods for construction of main pipelines and fulfill at least 55 percent of the welding through their use. To equip, under line conditions an additional 9 units of "Styk" and 10 "Sever" complexes. To weld 3500 kilometers of pipelines by the electric contact method. In conjunction with the Institute of Electric Welding imeni Ye.O. Paton to test an experimental model of an electrocontact machine for welding curved sections of large-diameter pipelines. To test a mobile unit for electric contact welding of pipes 114-325 millimeters in diameter and to work up documentation for the test results.

To develop the technology and technical specifications for equipment for trenchless laying of pipelines up to 1420 millimeters in diameter under rivers using the directional drilling method.

To continue putting into production new, highly productive machines and materials, automated systems and microprocessor equipment. To improve use of equipment, and ensure the work of the basic construction machines with a shift coefficient of at least 1.6.

To activate 16 robot-operators for the manufacture of connecting parts for pipelines and to develop and turn over to the machine builders technical requirements for building six automated operators for use in the sector's enterprises.

In conjunction with institutes of the USSR Academy of Sciences, to continue research on using new thermosettling materials for insulation and belts, on the basis of photochemical cross-linking of polyethylene. To produce in 1984 an experimental batch of thermosettling belts and test it.

To implement comprehensive research on using new efficient material--azerite--and to develop on its basis structural designs for residential housing purposes and to put into operation a test-industrial unit for the output of azerite at the Surgut House Building Combine.

With a view to further development of the complete block method of construction to implement standardization of the block-planning and structural designs for complete block assemblies and to reduce the product list of assemblies issued by the plants 1.5-fold. To manufacture at the sector's enterprises at least 6500 units for production purposes and to bring the volume of objects constructed by the complete-block method to 900 million rubles.

To ensure that capacities are put into production that determine a further increase in oil and gas extraction in the country.

For the oil industry. To build up, in Western Siberia, three new deposits and to put into operation units for oil preparation with a total capacity of 37.5 million tons a year, [dozhimnyye] and cluster pumping stations with a productivity of 428.600 cubic meters a day and 2550 kilometers of field pipelines.

To develop the capacities of the construction organizations for establishing a new oil region in Western Kazakhstan. To complete in the first six months construction of a complex of projects for extraction of 1 million tons of oil a year at the Zhanazholskoye deposit.

To construct the linear part of the Kholmogory-Klin oil pipeline at the Perm-Klin section a year earlier than the established deadline.

To complete in 1984 the five-year assignment for construction of main oil and product pipelines.

To put the product pipeline Sineglazovo-Sverdlovsk into operation 6 months earlier than the established deadline and supply products to Ul'yanovsk and Sverdlovsk ahead of schedule.

For the gas industry. To put into operation units for preparing gas at the Urengoy deposit, ensuring the planned increase in gas extraction.

To complete essentially construction of the linear part of the six gas pipelines Urengoy-Central Regions of the country, for which purpose, in September to put into operation the gas pipeline Urengoy-Center I for the entire length and to construct at least 2500 kilometers of the gas pipeline Urengoy-Center II before the end of the year.

To accelerate bringing to the planned capacity the gas pipeline Urengoy-Pomary-Uzhgorod, to put into operation the Khasyreyskaya, Sosnovskaya and Gornozavodskaya compressor stations ahead of schedule, in the first quarter of 1983.

To put into operation, in 1984, 19 compressor stations for the gas pipeline Urengoy-Center I, including ahead of schedule--Verkhnekazymskaya and Kungurskaya in May, the Pravokhetinskaya in June and the Sosnovskaya, Gornozavodskaya, Pomarskaya, Sechenovskaya and Staroyur'yevskaya in September.

With a view to converting to gas the major thermal electric power stations that use mazut as fuel, to fulfill the program for constructing gas pipeline branches to electric power stations.

To implement measures for ahead-of-schedule construction of projects for the extraction, stabilization and transport of condensate from the Urengoyskoye and Karachaganakskoye deposits.

To develop preliminary work to open up the Yamburgskoye deposit. To ensure putting into operation projects for extraction, preparation and transport of gas to Turkmeniya and Uzbekistan.

To begin construction of the test-industrial pipeline Belovo-Novosibirsk for coal transport.

With a view to comprehensive development of the sectors, to construct for all the buyers apartment houses with a total area of 2.05 million square meters, general education schools with a capacity of 15,400 students, hospitals with a total of 585 beds, polyclinics with a capacity of 2,000 outpatients and children's preschool institutions with a capacity of 10,400.

To carry out a set of measures for further social development of the work collectives. To construct for the sector's workers 615,000 square meters of housing, children's preschool institutions with a capacity of 2,800 students, sanitorium-dispensaries housing 360, boarding houses with a capacity of 520 and Young Pioneer camps housing 450.

To accelerate development of the planned capacity for large-panel house-building plants, and to fulfill 66 percent of the program for housing construction using large panels and parts with a high degree of plant readiness.

In supporting the initiative of the advanced collectives, approved by the CPSU Central Committee, to increase the output of goods for national consumption, to design and begin output through internal resources of items in broad demand, such as stock apartment houses for the rural locality, orchard and garden greenhouses, saunas for individual use, etc.

To put into operation capacities for 56,000 spindles at the cotton-spinning mill in Neftekamsk, and for 10 million square meters at the nonwoven fabric mill in Tuymazy.

With a view to putting into effect the Food Program, to ensure fulfillment of the year's plan for contracting work for the agroindustrial complex by 27 December. To introduce ahead of schedule capacities for the output of goods in the amount of 12.5 million rubles at the Belebey Test-Experimental Plant for Industrial Equipment.

To increase, by virtue of a counter plan, production of limestone meal by 30,000 tons.

In auxiliary rural operations in the sector to construct farms for 2600 head of cattle, 5000 hogs and 3000 sheep. To carry out reclamation and cultural-technical work for an area of at least 1000 hectares. To direct toward the workers' supply 1800 tons of meat and 2150 tons of milk.

On the basis of the activity of the sector's organizations and enterprises, to set measures for maximum reduction of power input for production by virtue of introducing advanced organizational structures and advanced technology, improving the use of machines and mechanisms and raising the quality of repair and technical service. To save at least 52 million kilowatt-hours of electric energy, 226,800 gigajoules of thermal energy, 10,000 tons of gasoline and diesel fuel, 27,600 tons of rolled ferrous metals, 71,000 tons of cement and 76,000 cubic meters of timber.

To implement, at the sector's precast reinforced concrete enterprises, heat treatment of items in the combustion products of natural gas in the amount of 216,000 cubic meters.

To issue to the sector's enterprises 2800 container units, type VZhK, 20 sport-health complexes and develop dormitory production for 50 persons.

To direct at least 90 million rubles for fulfillment of the comprehensive plan for improving labor protection measures and sanitation-health measures. To reduce the number of workers engaged in manual labor by 3800 persons. To continue scientific-research work directed toward improving conditions and protection of labor and improve preventive measures against production accidents. To train and raise the skills of 104,000 workers and expand the scale of instruction in Communist labor schools.

In 1984, to bring the volume of construction-installation work performed by the brigade contracting method to 53 percent of the total volume.

To ensure further development and increase in the efficiency of this advanced method:

In line construction--by virtue of introducing start-to-finish flow contracting of comprehensive industrial flow-lines operating according to a unified agreement with the workers' wages in accordance with a unified order;

In the construction of surface and industrial projects--on the basis of forming and converting to contracting of enlarged comprehensive brigades (sections);

In large-panel house-building--by virtue of wide-scale use of start-to-finish mobile crew flow-type contracting on the principle of "plant-transport-construction project."

To develop initiative and socialist enterprise of the work collectives and directors as the highest manifestation of disciplinary quality and responsibility. To cultivate a creative attitude toward work through adopting counter plans and raising socialist commitments.

To implement a set of measures to ensure the unity of the political, work and moral education of the construction workers. To strive for the formation in the collectives of a healthy moral climate, a favorable condition for criticism and self-criticism and to intensify the struggle against mismanagement, wastefulness, additions, poor workmanship and other violations of the norms of Communist code of ethics.

The workers, engineering-technical personnel and office workers of the organizations and enterprises of the sector assure the Leninist Central Committee Party and the Soviet Government that they will apply all their efforts, knowledge and experience for successful fulfillment of the tasks set by the December (1983) CPSU Central Committee Plenum and will mark 1984 with new achievements in labor.

The socialist commitments were discussed and adopted in the workers' collectives of the organizations and enterprises and were approved by the Board of the Ministry of Construction of Oil and Gas Industry Enterprises and the Presidium of the Central Committee of the Trade Union of Workers in the Oil and Gas Industry

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PIPELINE CONSTRUCTION

PIPELINE POTENTIALS REVIEWED

Moscow STROITEL'STVO TRUBOPROVODOV in Russian No 3, Mar 84 p 1

[Article: "Use All Potentials for Overfulfillment of the Planned Assignments"]

[Text] Fulfillment of the plan for 1984 is an extremely important stage in putting into effect the resolutions of the 26th Party Congress and the subsequent CPSU Central Committee plenums. Having accepted the materials of the December (1983) CPSU Central Committee Plenum and the Ninth Session of the USSR Supreme Soviet as the urgent program of action, the sector's workers are exerting their efforts for its implementation. The paths of achievement of new, higher milestones in the construction of projects for fuel power engineering were discussed at the expanded session of the board of the Ministry of Construction of Petroleum and Gas Industry Enterprises and the Central Committee presidiums of the sectorial trade union.

USSR First Deputy Minister of Construction of Petroleum and Gas Industry Enterprises V.G. Chirskov gave a report on the tasks of the organizations and enterprises of the ministry, ensuing from the resolution of the December (1983) Plenum of the CPSU Central Committee, decisions of the Ninth Session of the USSR Supreme Soviet and measures to fulfill the national economic plan for 1984. He analyzed the work of the collectives in 1983, the main result of which was putting into operation ahead of schedule the unique transcontinental gas pipeline Urengoy-Pomary-Uzhgorod, examined the construction program for 1984 and pointed out the basic directions for putting it into practice. This year contracting work amounting to at least 5 billion, 350 million rubles must be fulfilled, and moreover by its own efforts--96 percent of this amount. The structure of capital investments is becoming more complicated. The volume of surface work exceeds 54 percent as against 48 percent in the preceding years.

To fulfill successfully the extremely stepped-up program it is necessary to tighten up all the construction production units, balance resources and concentrate them with respect to time on the priority assignments. Construction of the most important objects must be carried out on the basis of the counter plans worked out by the main administrations and associations and the socialist commitments adopted, evaluation of the actual potentials of maneuvering resources for intensifying work and completing it in the necessary technological sequence in accordance with the priority of the construction projects.

There are also considerable reserves for increasing construction efficiency, which must be put into operation, in the production sphere, in work with the buyers and in administration. Acceleration of scientific-technical progress remains a decisive factor. Of great importance are increasing labor productivity, raising the quality and reliability of the objects being constructed, improving work with the personnel, reinforcing executive and labor discipline, intensifing the level of saving resources and disseminating valuable work initiatives.

The chiefs of the main administrations, associations and directors of comprehensive production lines and other subdivisions who spoke at the meeting, after having examined the results of the activity of their collectives in the past year and the work program for 1984, devoted a great deal of attention to potentials for raising labor productivity, the use of which will contribute to overfulfillment of the planned assignments.

Chairman of the Central Committee of the Trade Union of Oil and Gas Industry Workers V.T. Sedenko emphasized the fact that reinforcing all collectives should be directed toward achieving above-plan increase in labor productivity by approximately 1 percent and reducing production cost by an additional 0.5 percent.

The results of discussing measures to fulfill the programs for 1984 were summed up by Deputy Chairman of the USSR Council of Ministers B.Ye. Shcherbina. After describing the main directions of the sector's development, B.Ye. Shcherbina emphasized the fact that the pivotal task is utmost improvement of work quality and increasing its productivity. The rates adopted on the Urengoy-Pomary-Uzhgorod line must not be reduced. The organizations and enterprises of the ministry have a real potential for making 1984 a year of ahead-of-schedule fulfillment of a number of major tasks, specified by the five-year plan for the oil and gas industry, which will make possible successful implementation of the five-year plan as a whole. Improving the economic mechanism in the sector is a great production potential. Transition from the problem of the block-project to the block concept at the level of the oil field is important.

The Board of the Ministry and the Central Committee of Trade Union Presidium wholly and fully approved and adopted unswerving execution of the decree of the December (1983) CPSU Central Committee Plenum and the resolutions of the session of the USSR Supreme Soviet. Sectorial measures for fulfillment of these resolutions were confirmed. The socialist commitments adopted by the work collectives of the ministry's organizations and enterprises were approved.

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OIL, GAS INDUSTRY CONSTRUCTION PROJECTS, DEVELOPMENT REVIEWED

Moscow STROITEL'STVO TRUBOPROVODOV in Russian No 3, Mar 84 pp 6-9

[Article by USSR Deputy Minister of Construction of Petroleum and Gas Industry Enterprises G.I. Shmal': "The Sector's Industry--Condition and Perspectives for Development"]

[Text] The successful fulfillment by the sector of the constantly growing volumes of construction-installation work and ahead-of-schedule operational introduction of the most important projects which have an essential effect on the nation's economic system are related to a considerable degree to the development of the material-technical base of the ministry. Its basic task is to ensure maximum industrialization of construction and to succeed in the future in having the construction site become an installation site with minimum material and labor resource input to put the projects into operation and on this basis to reduce their construction periods decisively.

The advanced development of the material-technical base is the objective rule of construction, particularly under conditions of high and stable rates of its growth. Being oblivious to or ignoring this rule inevitably leads to serious lagging behind or else to failures in the activity of the associations, main administrations and sometimes of the construction ministries.

A material-technical basis new in principle was established in the Ministry of Construction of Petroleum and Gas Industry Enterprises in a relatively brief period. The special nature of this base lies above all in the fact that complete block assemblies (BKU) constitute a large proportion of the products manufactured by it. In 1983 in the sector fast-assembly prefabricated, complete buildings and block-boxes with a total area of 300,000 square meters were produced. In addition, machine-repair shops and metal structures for compressor, pumping and other objects with a total area of 220,000 square meters were manufactured. Some 5700 industrial block-boxes were produced to establish the oil and gas deposits and construct compressor and pumping stations.

Today the sector's material-technical base consists of 83 enterprises with quite a high level of technical equipment and advanced technology, producing a considerable volume of various goods. The commodity production volume is

815 million rubles; production of precast reinforced concrete is 2,350,000 cubic meters; production of efficient panels (made of shaped layering, aluminum) is 1,663,000 square meters; goods for machine building and metal working --192 million rubles; volume of capital repair for equipment at the sector's plants--32 million rubles; production of spare parts--10 million rubles.

In 1983, as compared with 1975, the production (sale) of industrial products increased 2.3-fold, of precast reinforced concrete--1.7 fold and of machine building products--2.6-fold. The sector's industry completed last year successfully, having fulfilled the plan for all the technical-economic indicators for the year and for the three years of the 11th Five-Year Plan. The equipment output in 1983 was: 100 trench excavators, 101 swamp vehicles, 1146 welding unit stations, set up on tractors, 1076 lash carriers and pipe carriers, 262 motor vehicle trailers, 150 trailers with a load capacity of 60 tons, 150 pipe layers with a load capacity of 6.3 tons and others.

The ministries can select several directions in the development of the material-technical base.

Industrialization of line construction, which constitutes almost half of the work volume fulfilled by the Ministry of Construction of Petroleum and Gas Industry Enterprises, is ensured by the industrial enterprises producing, in addition to the machines and mechanisms mentioned, special welding equipment, pipe-welding bases, lines for base welding and insulation of pipes, centering guides, etc. A large number of these enterprises are concentrated in the Remmekhgazprom Trust and the Soyuzremonttruboprovodtekhnika Association.

In 1983 alone the Remmekhgazprom Trust manufactured over 20 test models of new machines, mechanisms and equipment, including the TG-201 pipe layer, the fully shaped rotary excavator for making trenches in permafrost, TKUP-321 and US-23 welding units, LNKS-1 laboratory for nondestructive welding control, the first models of highly mechanized BTS 142 pipe-welding bases, produced in conjunction with enterprises of the electrical equipment industry and the Ministry of Heavy, Power and Transport Machine Building. Recently the enterprises of the Soyuzremonttruboprovodtekhnika Association manufactured 19 types of experimental models of construction equipment. They included a trailer on rubber-metal caterpillar treads, a lash carrier with a load capacity of 25 tons based on the KrAZ-260 motor vehicle, a bore hole driller and experimental IK-86 pipe-welding stand. Series production was developed of over 20 types of new construction equipment (anchor rotator, pile-driving unit, lash carrier, screw-in anchors, etc.).

Providing the construction workers with pipe assemblies and insulation materials is very important for successfully laying main pipelines and putting them into operation.

At present the production of connection parts, pipe assemblies and work pieces in the sector is concentrated at the Novosineglazovsk Combine of Building Structures (KSK) of the Soyuzneftegazstroykonstruktsiya Association. The combine is constantly developing, improving industrial processes, increasing

the type-list of goods produced and raising quality. The production of connecting pieces at the enterprise reached 21,335 tons in 1975, and in 1983--32,000 tons; production of pipe assemblies and pieces was, in the above years, respectively 1579 and 4618 tons. In 1983 new capacities were put into operation at the Novosineglazovsk KSK, which made possible a considerable increase in the output of pipe assemblies and pieces, as well as curved insertion pieces of any configuration, on the basis of using high-frequency currents.

At the same time, the need of the construction and installation organizations for shaped parts is continually growing. In 1984 the combine must install and develop the use of industrial equipment for the output of 2700 tons of small-diameter T-joints. This will make it possible to reduce the labor-intensity of work to manufacture them in the workshops of the assembly workers and considerably raise the quality and reliability of the objects constructed. New capacities for the production of pipe assemblies are to be developed and set up. In the near future, assembly of individual components at the construction sites must be dropped, and the transition made to assembling consolidated units and pieces for industrial connections for compressor and pumping stations and oil and gas field projects. Some experimentation in assembling a compressor station with the aid of consolidated units shows that its labor-intensiveness is reduced by 60 percent and the construction period lessened. The yearly need for such units is 11,000 tons.

The Ministry of Construction of Petroleum and Gas Industry Enterprises has also organized production of insulation foam, mastic, casings and other materials.

In 1983 the Novokuybyshev Insulation Material Plant produced 8200 tons of foam, installed equipment and manufactured the first samples of thermo-settling bands. This year 800 tons of thermo-settling bands are to be produced, as well as cold-application bands. This will make it possible to mechanize the insulation of joints at pipe-welding bases and on the line, considerably increase labor productivity in this vital operation and improve insulation quality. Large-tonnage production of insulation materials is to be set up at the Novokuybyshev Plant, and this will make it possible for the most part to provide the sector with its own insulation materials. The workers of the Soyuzneftegazkonstruktsiya Association, in conjunction with the sector's scientific subdivisions, the UkSSR Academy of Sciences and the USSR Academy of Sciences should carry out a persistent search for new, effective materials to protect structures from corrosion.

Plants producing complete-block units occupy a special place among the sector's enterprises. Their prompt and high-quality manufacture of block-boxes, light-weight enclosing structures and metal structures contribute to the further development of complete-block construction and a considerable reduction in the periods for building up oil and gas fields and construction of compressor and pumping stations. For example, at the Urengoy deposit, Unit No 9 for comprehensive preparation of gas was constructed and launched for operation in practically 4.5-5 months, with the norm stated by USSR Gosstroy being 2.5 years.

The ministry's chief enterprise for the manufacture of block items is the Tyumen BKU [complete block unit], of the Sibkomplektmontazh Association. In 1983 its collective triumphantly marked the output of the 10-thousandth block-box. Twice as many high-plant-ready items are produced here in a year as in all the rest of the prefabricated complete-block enterprises of the sector taken together.

The association's Young Komsomol Block Unit Plant (KMZBU) successfully developed output of blocks with increased plant readiness and substantial dimensions and masses--from 250 to 450 tons. KNS and DNS [not further identified] superblocks for a boiler house with DYe 25/14 boilers have undergone industrial testing and displayed high efficiency. The power of the block boiler houses produced by the Sibkomplektmontazh Association is about 4.2 gigajoules, which corresponds to the power of a large TETs. Preparations are being made for the output of superblocks, fully plant ready, with a mass up to 1000 tons, to build up the Yamburgskoye deposit.

Prefabricated-complete-unit enterprises in other regions of the ministry's operation are manufacturing, on the whole, 1800 block-boxes. Modernization of these enterprises and finishing off the industrial processes is in progress and this will make possible, by the end of the five-year plan, a sharp increase in the output of block products.

Using the example of the complete-block method, one can see a tendency toward organic merging of industrial and construction production, which makes possible a sharp rise in the industrial nature of construction and its efficiency.

Directly connected with the development of the complete-block method is the output of light enclosing structures, metal structures and other items. The production volumes of these items in the sector are increasing at the Oktyabr'skiy Metal Structure Plant and at the Serpukhovskiy and Novosineglazovskiy building structure combines.

While on the average for the country, for 1 million construction-installation jobs (SMP) there are 1.34 tons of aluminum structures and items, in the sector the number is over 2 tons, i.e., half again as many. Also considerably higher for us, as compared with other construction ministries and the average figures for the country, is the level of prefabrication in construction, which reached 72 percent; the proportion of large panel and large block housing reached 66 percent. These are important components of the sector's efficiency.

There are now over 60 enterprises for precast reinforced concrete and large-panel house building, with a total capacity of 2,940,000 cubic meters, in the system of the Ministry of Construction of Petroleum and Gas Industry Enterprises. In 1983 they produced about 2,500,000 cubic meters of reinforced concrete items, including parts for KPD [large-panel plant for housing construction], pavement slabs, [prigruz], and piles, being respectively 700,000, 470,000, 410,000 and 120,000 cubic meters. The production increase was 17.4 percent (by 1980) and the use of capacities increased by 7 percent.

The tendency outlined toward continuous growth of product output is the result of increasing discipline, strengthening the work collectives and introducing brigade contracting. The initiators for accelerated introduction of brigade contracting the building structure production were the Ukhta Stroyindustriya Production Association and the Surgut House Building Combine (DSK), where the brigade form has encompassed over 80 percent of the workers.

Technical reequipment of industrial enterprises is being implemented. For example, at the enterprises of Glavzapsibzhilstroy [not further identified] and Glavneftegazstroy [Main Administration of Construction of Petroleum and Gas Industry Enterprises] of the Soyuzneftegazstroykonstruktsiya and Tatneftestroy Associations, modernization of the vibration equipment has begun, as well as replacement of series high-frequency vibration-units by low-noise low-frequency type VPG units.

A great deal of attention is being paid to the use of efficient, resource-saving technology. For example, on the initiative of the Ukhta KPD and SF [not further identified] Plant of the All-Union Scientific Research Institute for the Construction of Pipelines, the ministry's enterprises are introducing treatment of items in natural gas combustion products. Some 156,000 cubic meters of items have been treated by the new method, with the saving exceeding 300,000 rubles.

In order to save heat, energy resources and materials through using enclosing structures for residential and industrial buildings made of claydite-concrete with a volumetric mass of up to 1000 kilograms/cubic meter, a program is being implemented to develop new thermal-insulation materials. An azerite plant is being constructed in Surgut and an experimental vortex unit to produce calcined claydite sand is being constructed in Al'met'yevsk. Obtaining azerite with the assigned volumetric mass and nonfragmented claydite sand, as well as using heat treatment of the panels in natural gas combustion products make it possible to organize stable output of enclosing structures with a volumetric mass of up to 800 kilograms/cubic meter and, due to the reduction in their thickness, to ensure a high economic effect. Introduction of the technique of glazing exterior wall panels for apartment houses has been begun on the initiative of the Orgtekhstroy Trust of Glavzapsibzhilstroy.

Wide-scale use of secondary raw material, including metallurgical slag, TETs ashes and others is outlined in the production of building structures.

The program for technical reequipment of KPD enterprises specifies the introduction of stamped insertion pieces. This will make it possible to save, per 1 million square meters of total housing area, up to 800 tons of rolled metal, 280,000 kilowatt-hours of electric power, and to reduce labor input by 32,000 man-hours. Introduction of new insertion pieces was begun in 1983 at the Al'met'yevsk KPD Plant. After manufacture by MEMZ [Moscow Experimental Machine Plant (of the Glavgaz, USSR)]of industrial equipment (stamps) in 1984 a test batch will be manufactured.

The basic directions for development of large-panel house building in the sector were determined by the "Comprehensive Program for Modernization and Technical Reequipment of Large-Panel House Building Enterprises of the Ministry of Construction of Petroleum and Gas Industry Enterprises up to 1990."

The capacities of the ministry's house building combines increased 2.7-fold during 1975-1980 and the first three years of the 11th Five-Year Plan and constitute 1,463,000 square meters, including 690,000 square meters in Western Siberia (with the Vinzili combine).

One of the main indicators for the work of house building combines and their large panel house structures is the level of production capacity utilization. In 1983, for various house building combines it was characterized by the following figures (in percent): Surgut--94.9; Tyumen--57.4; Nadym--74.5; Uray--91.8; Neftekamsk--74.6; Orenburg--30.8; Otradnenskiy--31.4; Ukhta--93.2; Al'met'yevsk--56.5; Nebit-Dag--49.6; Apsalyamovskiy--52.

An analysis of the data presented attests to the fact that the available resources are not utilized at plants producing parts for houses. KPD plants in Glavneftegazstroy are operating particularly unsatisfactorily, as are those in Al'met'yevsk and Nebit-Dag.

The work input to produce 1 square meter of housing is high. The inadequate degree of plant readiness leads to high labor input at the construction site.

The output of products per square meter of production sites is inadequate and uneven. For example, at the Surgut KPD and Tyumen, Uray, Nadym and Neftekamsk enterprises it is respectively 10.5; 6.6; 8.3; 5.1 and 6.8 cubic meters.

The basic reason for this situation that has formed at the KPD enterprises is the unsatisfactory level of technology. The workers for the engineering services of the shops and plants do not pay the proper attention to setting up and improving the industrial processes and organizing production. Mechanization of operations, particularly finishing work, is inadequate. The equipment of the work places must be substantially improved. Their certification must be carried out, using the experience of leading enterprises, the individual work places reduced and people released for other operations. The directors of the main administrations and associations and the work collectives of the plants should outline measures for a considerable improvement in the indicators for utilization of the existing production potential.

As emphasized by the December (1983) CPSU Central Committee Plenum, work must be intensified for extremely rapid achievement of the planned labor intensiveness of the output and increase in the shift system for equipment. This is an urgent problem for the sector, and attention to it will make possible a substantial increase in output and quantity of housing put into operation.

Ensuring the required quality of the products put out by the KPD enterprises is very important. The basic directions for its improvement are increasing the plant readiness of parts and transfer of labor-intensive work from the construction sites to plant shops; using advanced technology, including the production of modular bathroom-lavatory prefab box units, elevator shafts, garbage chambers and wide-scale use of holder units, super-plasticizers and various methods of treating the surface of exterior wall panels; introduction of a comprehensive system of quality control.

The sector's industry is producing a large number of special stint housing facilities and cultural-everyday living projects. The ministry's enterprises are producing mobile homes, including the TsUB's of the Volokolamsk Plant--the best items among those manufactured in the country for similar purposes with respect to comfort, ease of transport and thermal engineering characteristics. Special stint housing complexes (VZhK) are produced by the Oktyabr'skiy Plant in the form of dormitories for 40 persons with a full set of necessary facilities--a dryer, a reading corner, kitchen, lavatory, etc.

The EKB [Experimental Design Office] for Reinforced Concrete developed a more comfortable dormitory for 50 persons, the first model of which is being tested. A Pioneer settlement at Yamburg will be constructed from such complexes. The Serpukhov Plant is producing 15-20 complete prefabricated sports complexes with a swimming pool and agitation machines for training work under line conditions.

The Soyuzneftegazstroykonstruktsiya Association is manufacturing a Tonus block with a sauna bath and shower units, dining rooms seating 60 persons in block version and other objects. Glavzapsibzhilstroy is producing KDMO [not further identified] blocks, which are widely used for the construction of apartment houses and dormitories.

In 1983 the production volume of fast-assembly special stint housing exceeded 280,000 square meters (4084 mobile homes, 2642 VZhK blocks and 3730 KDMO blocks). If one considers that the ministry produces compact block boiler houses, sewage purification structures, water conservation objects, etc., then setting the tasks for development by the end of the five-year plan for output of complete special stint settlements with a full set of objects required for living conditions is totally realistic.

An important direction in the activity of the collectives at the sector's industrial enterprises is the production of goods for cultural-everyday living and household purposes. In 1983 the plan for output of these goods was, on the whole, fulfilled, and a production growth, as compared with 1982, of over 30 percent was ensured. The sector is thus making a contribution to working out the tasks set by the party and the government with respect to providing the population with goods in national demand.

At present 56 industrial enterprises of the ministry are issuing, for sale to the population, over 50 types of commodities.

By no means all the potentials, however, have as yet been put into action. The directors of the main administrations, associations and enterprises are not paying the proper attention to studying market demands, are interacting poorly with the trade organizations in the outlying areas and are not concerned about expanding the variety of goods issued. For example, Glavzapsibzhilstroy regularly fails to fulfill the plan for furniture production. The Novosineglazovskiy KSK produced goods worth a total of 27,000 rubles, with the product list limited to simple items.

It is time to think seriously about a fundamental change in the state of affairs regarding commodity output.

The program for production of goods in national demand in 1984-1985, worked out at present by the sector, specifies an increase in their production volume up to 3.8 million rubles in 1984 and up to 8 million rubles in 1985. The work of the sector's industrial enterprises must be oriented toward these milestones, and it must be borne in mind that two basic directions must be realized: developing the production of large durable goods, particularly individual houses, greenhouses, saunas and garages; output of ordinary items, with the demand of local trade organizations being tested.

The main administration and associations should take active measures to utilize production wastes and seek material-technical resources to manufacture goods in daily demand. Their output must be ensured at each industrial enterprise, after having specified establishment of specialized shops and sections.

When characterizing the sector's industry, one cannot help but note that work enthusiasm, a high degree of conscientiousness, initiative and enterprising spirit, penetrating all the subdivisions of the Ministry of Construction of Petroleum and Gas Industry Enterprises, is in full measure typical also of the collectives of industrial enterprises. 1983 passed under the banner of ahead-of-schedule construction of the unique Urengoy-Pomary-Uzhgorod gas pipeline. There is not a plant, shop or section where there is not lively and effective competition for fulfillment of the commission for this construction project.

The brigades of A.N. Zemlyanskiy and A.M. Stoilovskiy from Novosineglazovo, D.Z. Khafizov and F.K. Galyautdinov from the Oktyabr'skiy Plant, A.I. Kemayev and A.I. Suslin from the Novokuybyshevskiy Plant, V.K. Feofanov from MEMZ, V.P. Pisenko from KEM [not further identified], A.I. Petryashov from the Ukhtagazstroymash Plant and Lenin Komsomol Prize Laureate N.Ya. Shalatonov from the Bryanskiy Plant and hundreds of others are working steadily, with high skills, competently and with high quality in overfulfilling the assignments set and counter plans adopted.

The brigade form of labor organization, which is an important means of increasing production efficiency and work quality, training workers and reinforcing discipline, has been widely disseminated. There must be persistent and specific concern for further improvement of the brigade form of labor organization, with guidance from the experience of the best collectives, analyzed and approved in detail at the sectorial conference in Bryansk.

What promises for the development of the sector's industrial enterprises!

Machine building will grow and be improved due to construction of new plants and modernization and expansion of existing enterprises. In the future, obviously, the volume of machine building output should be doubled in order to provide for the demands of construction organizations for special equipment. We are to establish a powerful industry for repair of equipment and output of spare parts; make broader use of electroslag remelting, developed at the enterprises, investment casting, reconditioning parts by means of plasma spraying, etc.

By the end of the 11th Five-Year Plan the capacities and output of block-boxes will be doubled, primarily at the Sibkomplektmontazh Association, and the production of light structures, SKZ [not further identified] and unit buildings will increase considerably. It is important in principle to develop the base for output of superblocks, for development of the Yamburgskoye and other northern deposits by the old methods is unthinkable in general, with the use of ordinary blocks being quite labor intensive and of low efficiency. The development in the Sibkomplektmontazh system of enterprises to manufacture devices for air cushioning, a plant for unit metal structures, etc., must be accelerated.

A serious problem for the sector is to expand large-tonnage production of thermal insulation materials. This is primarily the task of Glavurengoygazstroy, which, despite the fact that there is a well-defined long-term program, is doing quite unsatisfactory work in this direction.

In connection with the changed requirements for ballasting pipelines, the demand for precast reinforced concrete is considerably increasing. Work volumes for public facilities and amenities and for laying roads are increasing. Therefore the production of precast reinforced concrete must be doubled through accelerated construction of quick-assembly plants for the output of [prigruz] and expanding the existing plants in the European section of the country.

An extremely important task is the development of the Kharpskiy Plant and bringing it to a capacity of up to 1 million cubic meters of precast reinforced concrete per year and 3 million cubic meters of ballast.

A certain increase should be achieved in the capacities of large-panel house building and enterprises producing items for cultural-everyday living items. The Surgut, Nadym and Tyumen KPD plants are being expanded, the Ukhta plant is being constructed and the Urengoy plant is being designed. To ensure putting housing into operation there must be a considerable increase in capacities for the production of woodworking items.

There must be continuous, purposeful and specific work on all these problems, as well as wide-scale introduction of the latest achievements of science and technology into the work of industrial enterprises, coordination of the decisions adopted with the tendency for development of the oil and gas industry and active study of the projects, while attaining minimum labor-intensity, maximum prefabrication and automation of the objects being constructed. The capacities must be developed more quickly and the quality of the output be improved.

The certified product level must be raised including that at Glavneftegazstroy, Glavzapsibzhilstroy and Glavkomigazneftestroy. There must be no being reconciled to the fact that the enterprises of Glavtyumenneftegazstroy, Glavukrneftegazstroy and Glavyuzhtruboprovodstroy are producing non-certified items.

There should be industrial charts for manufacture of products everywhere, and particularly in the production of reinforced concrete structures.

Reduction of the production cost and growth of profit, capital-output ratio and unconditional fulfillment of the supply plan is important for improvement of technical-economic indicators.

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PIPELINE COMPETITION RESULTS FOR BEST TECHNICAL SOLUTION REVIEWED

Moscow STROITEL'STVO TRUBOPROVODOV in Russian No 3, Mar 84 p 4

[Article: "Results of the All-Union Competition 'For the Best Scientific-Technical Solution Contributing to Ahead-of-Schedule and High-Quality Construction of the Urengoy-Pomary-Uzhgorod Gas Pipeline"]

[Text] The Central Board of the Scientific-Technical Society of the Oil and Gas Industry (NTO NGP) imeni Academician I.M. Gubkin summarized the results of the All-Union Competition "For the Best Scientific-Technical Solution Contributing to Ahead-of-Schedule and High-Quality Construction of the Urengoy-Pomary-Uzhgorod Gas Pipeline."

As the result of the organizational work done at the All-Union Competition, 43 works were presented from the primary organizations of six oblast and republic boards of the NTO NGP.

In accordance with the results of the competition, the authors of 11 works were awarded Certificates of the Central Board of the NTO NGP and monetary prizes. The first prize was awarded to the work, "Scientific-Methodological Safeguarding Against Labor and Social Problems in the Construction of the Urengoy-Pomary-Uzhgorod Gas Pipeline." The authors: A.P. Vesel'yev, V.F. Matusyak, Yu.R. Anpilogov, V.M. Agapkin and A.D. Khaytun.

The methods presented in the work for managing the social development of collectives of main pipeline construction workers, planning the disposition of the labor resources throughout the construction regions, using the expeditionary special work shift method of organizing labor, selection of efficient levels of work activity with expeditionary-special work shift organization of labor and social-everyday living provision of mobile construction was fulfilled by the colleagues of the NIPIorgneftegazstroy [not further identified] in conjunction with the workers of the Ministry of Construction of Oil and Gas Industry Enterprises. The economic effect from increasing the stability of the flow line collectives and using the expeditionary-special shift work method of labor organization was 12.7 million rubles.

The work, "Structural Scheme of a Standard Comprehensive Pipeline Construction Flow for Rapid Construction of the Urengoy-Pomary-Uzhgorod Gas Pipeline" was also awarded first prize. The authors: L.M. Pal'chikov and V.I. Klimov.

The distinguishing feature of the new structural scheme is the flow-specialization of its component subdivisions in accordance with the results of the production processes and orientation of the activity of the flow toward finished output, i.e., toward construction and turning over for operation a fully completed section of the gas pipeline. As the result of introducing the new structure, the average yearly output of the flows from the Kuybyshevtruboprovodstroy, Svarochno-montazhnyy and Soyuzgazspetsstroy trusts of Glavtruboprovodstroy [Main Administration for Pipeline Construction], as compared with 1980, increased four-fold and exceeded the yearly output for a single flow, planned for the end of the 11th Five-Year Plan, by over 1.5-fold.

Second prize was awarded to the following three works. The first was "Organizational-Technological Systems for Comprehensive Production" (Omsknefteprovodstroy Trust). Setting up comprehensive industrial flows reduces the construction periods and ensures high reliability of the construction processes by virtue of advancing construction of technically complicated sections. The second work was "Optimization of the Technological Parameters of the Urengoy-Pomary-Uzhgorod Main Gas Pipeline" (YuzhNIIgiprogaz) [Southern State Scientific Research Institute for the Design and Planning of Gas Pipelines]. Optimal solutions adopted in accordance with the technological systems of KS [compressor stations] on the basis of aggregates with a unit capacity of 25 megawatts made it possible to reduce the specific established capacity by 13 percent as compared with the best gas-pipeline analogs. The third work is "Increasing the Productivity and Quality of Manual Arc Welding for Construction of the Urengoy-Pomary-Uzhgorod Gas Pipeline." The work is dedicated to problems of improving the structure of machines for manual arc welding, increasing the reliability of the sources of the welding current and increasing the productivity and quality of manual arc welding. Multioperator sources of the current have made it possible to accelerate the rates of constructing gas pipeline sections.

Third prize was awarded to the authors of works presented by the primary organizations of NTO NGP of Orgtekhtruboprovodstroy [no further identification], the Ministry of Construction of Oil and Gas Industry Enterprises and VNIIST [All-Union Scientific Research Institute for the Construction of Trunk Pipelines].

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GENERAL

USSR'S PROGRESS IN DEVELOPING ITS ELECTRIC POWER POTENTIAL

Moscow EKONOMICHESKAYA GAZETA in Russian No 13, Mar 84 p 1

/Article: "Electric Power Potential of the Country"/

/Text/ Throughout the history of the Soviet state the Communist Party has accorded priority importance to the development of the power generation industry and particularly to electrification as the most significant condition for the building of socialism and communism. This statement is contained in "Basic Positions of the USSR Electric Power Program Over the Long Term."

The following tasks should be resolved in the electric power generation industry over the upcoming two decades:

--a reduction in the fuel balance of electric power plants, first of the percentage of mazut and then of natural gas, in favor of the construction primarily of nuclear power plants, thermal electric power plants utilizing cheap coal mined by the open pit method, and large hydroelectric power plants primarily in the eastern regions of the country;

--completing the formation of a Unified Electric Power System for the country with an increase in its flexibility and reliability through the construction of peak period electric power plants, super high-tension direct and alternating current power lines, and an improvement in the quality of the electric power provided to customers;

--the further development of the cogeneration of electric and thermal power.

Much in this regard is being done in the current 5-Year Plan. As the diagram indicates, our country is persistently carrying out improvements in the structure of electric power generation. In 1975 nuclear power plants accounted for less than 2 percent, while in 1983 they accounted for almost 8 percent, and the 1984 plan projects an increase to more than 9 percent. The percentage of electric power generated by GES's is also increasing.

Electric Power Generation, In Billions of Kilowatt Hours For the USSR As a Whole, and Including Thermal, Nuclear and Hydroelectric Power Stations

Key:

1. Total
2. Thermal power plants
3. Hydroelectric power plants
4. Nuclear power plants
5. Plan

Speaking at a meeting with voters on the achievements of the Soviet economy, Comrade K. U. Chernenko, as premier, mentioned the development of a unique nuclerar reactor with a capacity of 1.5 million kilowatts. This giant has been put into operation at the Ignalin AES in Lithuania. Recently, the builders and operators of the Chernobil' AES in the Ukraine won the high praise of the CPSU Central Committee for starting up successfully its fourth generating unit, with a 1 million kilowatt capacity.

The electric power potential of all sections of the country is increasing. In the European part of the USSR in 1984 new facilities will become operational at the Smolensk, Kalinin, Kol'sk, Balakov, Zaporozhets and Yuzhno-Ukrain nuclear power plants, and at the heat and electric power stations in Moscow, Kiev and Vilnius. To improve the power supply situation in Siberia new units will be placed under load this year at the Sayano-Shushenskaya and Mainskaya GES's, a generating unit with an 800,000 kilowatt capacity at the Surgut GRES-2, as well as large installations at the Omsk, Kemerov, Krasnoyarsk and Irkutsk TES's. In Kazakhstan, construction will be completed on the Ekibastuz GRES-1 with a capacity of 4 million kilowatts.

In 1984, in accordance with the objectives of the Energy Program immense resources were allotted to the development of the fuel and power sector--40.8 billion rubles.

In the Energy Program, great attention has been devoted to the conduct of an active energy conservation policy based on the acceleration of research and development progress in all sectors of the national economy and in daily life, through all possible economies in the use of fuel and energy, and the assurance on this basis of a substantial reduction in the specific energy intensiveness of the national income.

The 1984 plan establishes rigorous objectives for the management of fuel and energy resources. Expenditures of energy per unit of national income are projected to decline by 1.5 percent.

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DISCUSSION OF ALTERATIONS NECESSARY IN ENERGY PROGRAM

Riga SOVETSKAYA LATVIYA in Russian 21 Dec 83 p 2

/Interview with Valentin Venikov, doctor of technical sciences, Lenin Prize Laureate professor at the Moscow Energy Institute, conducted by S. Abramov, Novosti Press Agency: "Electric Power in the USSR in the 1980's"/

/Text/ Over the past 20 years, electric power generation has increased worldwide by a factor of more than 3.5. In particular, the United States has recorded a 2.8-fold increase over this period, the countries of the European Economic Community a 2.9-fold increase, and the USSR a 4.4-fold increase.

The further development of the Soviet electric power industry depends on serious changes in the structure of the fuel and energy balance of the country.

What are the most important of these changes? A correspondent of the Novosti Press Agency asked this question of one of the leading specialists in the modeling of complex energy supply systems, Valentin Venikov, doctor of technical sciences, Lenin Prize laureate, and professor at the Moscow Energy Institute.

"The USSR Energy Program, which has been developed with a long term perspective," noted Professor Venikov, "provides above all for an acceleration in the development of nuclear power generation. In the 1981-1985 period, nuclear power plants will account for practically all of the increases in electric power generation in the European part of the Soviet Union.

"Such a focus is no accident. Let me remind you that about 90 percent of the fuel and energy resources are located in the eastern regions of the USSR, while three-quarters of the electric power users are situated in the European portions of the country. Nuclear power plants restrict organic fuel requirements and make possible a reduction in the scale of transportation.

"At present in our country 18 nuclear power plants are under construction. Their basic equipment consists of power generation units with a capacity of 1 million kilowatts. Each million kilowatt facility saves roughly 3 million tons of coal annually, the transportation of which would require 50,000 freight cars. As a result the production costs of electric power at a number of nuclear power plants is already today lower than at thermal plants.

"A second structural shift in that portion of the power industry that does not require organic fuels consists of the broader application of hydropower resources, especially in the eastern reaches of the USSR. In Siberia, for instance, construction is nearing completion of the Sayano-Shushenskaya GES, the largest in the country with a capacity of 6.4 million kilowatts, and the Boguschanskaya hydrostation is also being built, with a capacity of 4 million kilowatts. Large hydroelectric plants are also being built on the rivers of Central Asia and the Far East.

"In the European part of the country, where the most promising water resources have almost been exhausted, the construction of pumped storage power plants is being counted on. This is to a large degree connected with the extensive nuclear power plant construction program and with the necessity for increasing the flexibility of the electric power system. Low capacity pumped storage power plants are already in operation below Kiev, and construction is proceeding on two more powerful pumped storage plants, at Zagorsk, below Moscow (1.2 million kilowatts) and at Kayshyadorsk in Lithuania (1.6 million kilowatts)."

/Question/ But the basic "electricity factories" of the 1980's will remain, obviously, thermal electric power plants?

/Answer/ Thermal power plants (TES) will retain their leading role for some time yet, even hough their percentage of overall energy production will decline somewhat: to 71 percent in 1985 in comparison with 80 percent in 1980. Large new thermal power plant complexes are now being built only in the eastern regions of the country, on the basis of the cheap coal of the Ekibastuz (Kazakhstan) and the Kansk-Achinsk (Eastern Siberia) fields, as well as on the basis of the natural gas and casing head gas of western Siberia.

/Question/ The 700 electric power plants of the European parts of the USSR, Siberia and Kazakhstan are united in the Unified USSR Power System, the world's largest. How will this system develop in the future?

/Answer/ The upcoming 5-7 years will represent the culmination of the formation of this system. The power pools of Central Asia and the Far East, which so far have been functioning independently, will be hooked up to the system, as well as separate power systems in remote northern and eastern reaches of the country. This unified power system will then encompass practically all of our inhabited territory and handle 97-98 percent of all electric power generation.

The construction of superhigh voltage electric power lines will play an important role in the development of these energy systems. In upcoming years a new class of main electric power transmission lines will begin to operate in our country, carrying 1,150 kilovolts of alternating current and 1,500 kilovolts of direct current. Electric power lines carrying such high voltage exist nowhere else in the world.

Both lines originate in the above mentioned region of Ekibastuz. The direct current line stretches into the center of the European part of the USSR, and the direct current line to the Urals. A 900-km segment of this line will become operational by 1986. The switch to super high-tension required the development

of new insulating materials, protective apparatus, automated control and communications systems. For the Ekibastuz-Center line, for instance, more than 60 items of new equipment were developed.

/Question/ In what other spheres of the electric power industry will new power equipment appear in upcoming years?

/Answer/ In the nuclear power industry the unit capacity of reactors is increasing. For instance, at the Iganlinskaya AES in Lithuania, power generation units with a capacity of 1.5 million kilowatts each are being installed. The first nuclear heating plants are being built in Gorky and Voronezh on the basis of reactors that generate heat rather than electric power. Near Odessa construction is proceeding on a nuclear heat and power plant, i.e. a plant that will simultaneously produce both electricity and heat.

In conjunction with specialists from the CEMA member countries, development is proceeding on steam driven equipment and flexible installations fired by solid fuels to cover peak system loads.

Great attention is being devoted to the development of magnetohydrodynamic (MGD) installation which are capable of transforming thermal energy directly into electric power. The use of these installations as a "superstructure" on top of traditional electric power plants could complete a revoltuion in thermal power generation, sharply increasing the effective use coefficient of existing TES's. An MGD power unit now being built in Ryazan with a capacity of 500,000 kilowatts will operate on natural gas. At the same time, preparatory work is proceeding on a 1 million kilowatt coal-fired power generation unit.

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